DOCUMENT RESUME

ED 149 487 EA 010 313

TITLE Manual for Planning and Construction of School Buildings.
INSTITUTION New Hampshire State Dept. of Education, Concord.
PUB DATE 75
NOTE 105p.

EDRS PRICE MF-$0.83 HC-$6.01 Plus Postage.
DESCRIPTORS Architects; Educational Environment; *Educational Specifications; Elementary Secondary Education; Energy Conservation; *Facility Guidelines; *Facility Requirements; Financial Support; Fire Protection; Legal Responsibility; School Community Relationship; *School Construction; School Design; *School Planning; Site Selection; Standards
IDENTIFIERS New Hampshire

ABSTRACT

This manual has been revised since the last guide published in 1971 to keep flexibility as a fundamental objective. The manual contains suggestions, recommendations, and minimum requirements regarding school facility planning. A new chapter entitled "Energy Conservation Through Better Construction" has been added to the manual. (Author/MLF)

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ED149487

Manual for Planning and Construction of School Buildings

1975

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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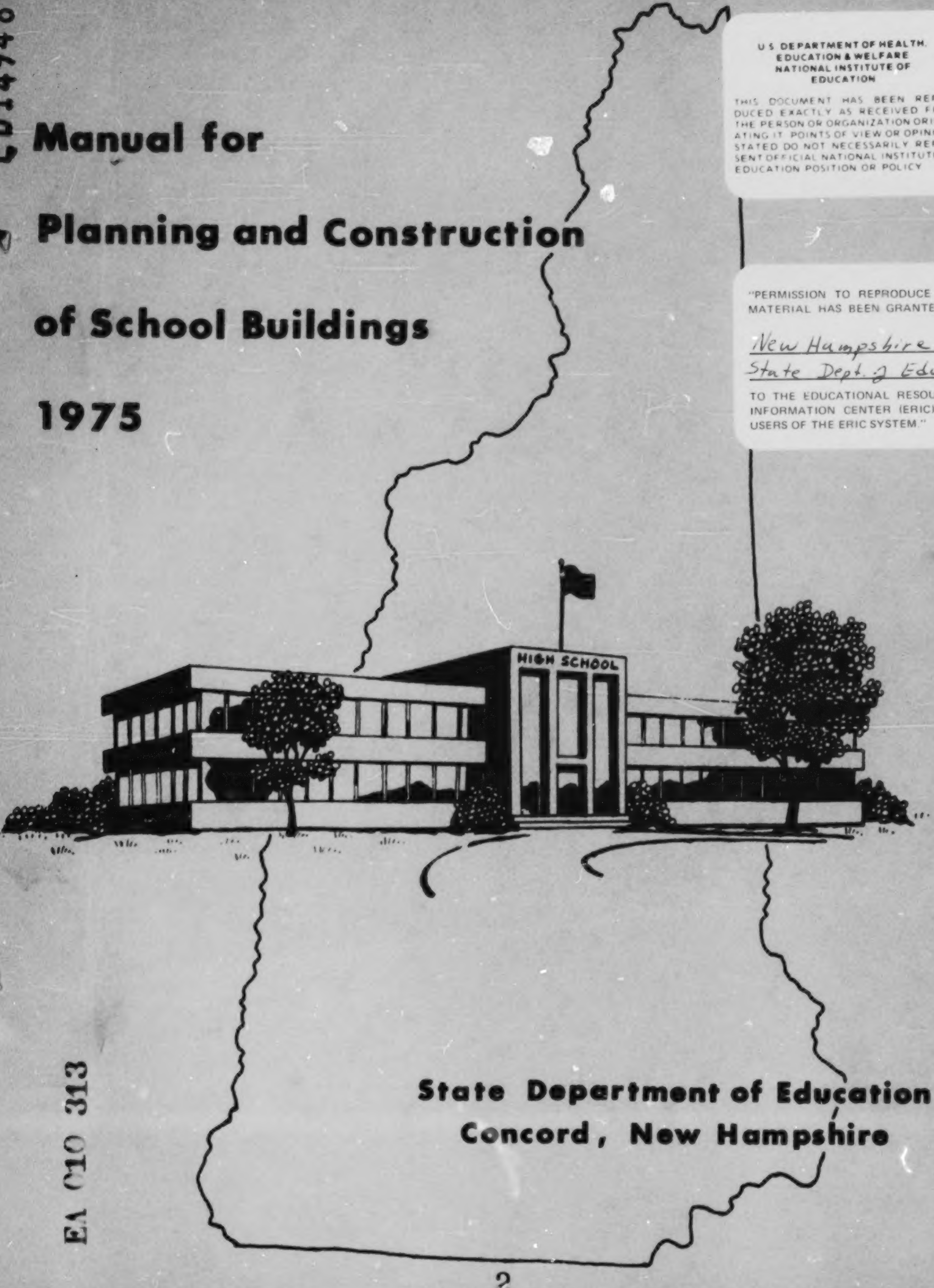

EA 010 313

State Department of Education
Concord, New Hampshire

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The following policy was unanimously voted by the State Board of Education at a meeting held on July 16, 1975:

> "It is to be expected, before approval of any submitted building plans for any purpose that involves school construction, that the very latest technology available will be utilized in energy conservation."

FOREWORD

As stated in the previous guide, New Hampshire has built many excellent school facilities since 1960. Some areas of the state are still experiencing space needs, but as we enter the mid-1970's enrollments seem to be leveling, and even declining in parts of New Hampshire. This fact adds a new dimension to good school planning.

Those who are responsible for planning new facilities must examine the needs of the entire district, not only in light of new educational methods and philosophy, but also in light of the impact of present and future enrollments upon the district's physical plants. Construction of new space and purchase of new equipment must be done in ways that will permit as much flexibility as possible, and still be economically sound.

Construction of school buildings today should not be so permanent in nature that the building determines the program indefinitely, thereby leaving little opportunity for newer methods. A dollar spent wisely today can be a better investment tomorrow.

Since the last guide was published in 1971 our state and nation have been confronted with the serious problem of energy-utilization and conservation. As a nation and a people we have taken for granted the abundance of energy sources. Economically and socially, the crisis faces us all. With country and worldwide supplies diminishing, a new era of finding means of more efficient utilization of energy is essential.

A new chapter entitled "Energy Conservation Through Better Construction" has been added to this manual. Hopefully, the suggestions and recommendations given will be helpful to school planners of new buildings, and to those responsible for operating present buildings in an economical manner. **WHEN RECEIVING PLANS FOR BUILDING AID APPROVAL, PARTICULAR ATTENTION WILL BE GIVEN TO ENERGY CONSERVATION FEATURES IN THE DESIGN OF THE PROJECT.**

This manual for Planning the Construction of School Buildings for New Hampshire has been revised to keep flexibility as a fundamental objective. The manual contains suggestions, recommendations and minimum requirements regarding school facility planning. Basic requirements have been established in accordance with sound school planning.

Sincere appreciation is extended to all who have helped in the revision of this material. I know the many hours the committee has spent in completing this manual, and I am sure school districts in New Hampshire will profit from its work.

Dr. Newell J. Paire,
Commissioner of Education

MANUAL FOR PLANNING THE CONSTRUCTION OF SCHOOL BUILDINGS

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SCHOOLHOUSE CONSTRUCTION MANUAL

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CHAPTER I - PLANNING EDUCATIONAL FACILITIES

Long-range planning for educational needs is a vital part for a community's orderly growth and and development. The educational climate provided by a community determines to a large extent its outlook for the future. A school plant provides the general environment in which learning is to take place and must be the end result of a careful process of preparation and development. Participation and active involvement of school board members, citizens, professionals, teachers and students are essential to the success of any school building program. Long-range planning takes time. With changes being made in building design and environment, today's school buildings have more flexibility. Schools are being designed to enable inclusion of many activities and can no longer be isolated from maximum use. Increasing costs of building make it essential that schools be constructed economically and efficiently. If the building is to serve its occupants and at the same time be a wise investment for the community, it is obvious the total building is not a short-term experience.

PARTICIPANTS IN THE PLANNING PROCESS

The planning process requires many decisions on the part of several agencies and individuals. The participants may be divided into three categories: (1) agencies or persons directly responsible for educational administration and policy making; (2) agencies or individuals from the community including the school committee; and (3) professionals retained by the school board.

CATEGORY ONE

A. STATE BOARD OF EDUCATION - - This board, made up of seven lay citizens appointed by the Governor and Council, is the highest policy-making body in the state educational system. By law, the board is responsible for the examination, review, and approval of all building programs for which school building aid application is made. (cf. RSA Chapter 198:15)

B. STATE DEPARTMENT OF EDUCATION - - The Department of Education carries out the policies of the State Board of Education and provides services for the school districts. With reference to school building programs, the department:

1. Works with local districts and officials to develop effective educational programs.
2. Assists in surveying school building needs at the local level.
3. Assists in the selection of school sites.
4. Establishes standards for school construction.
5. Provides information on construction methods, materials, and costs.
6. Consults with local districts in establishing educational specifications to assure functional adequacy in the program.
7. Reviews preliminary and final drawings and specifications for evaluation and approval.
8. Recommends to the State Board of Education approval of drawings and specifications for granting building aid.

C. LOCAL SCHOOL BOARD - - The district board of education is the cornerstone of school organization at the local level. It establishes educational policies pertaining to the local district and is the agency to initiate long-range planning for school needs, as one of its responsibilities is continual evaluation of the educational process of the community. The board performs the following functions with regard to school construction:

1. Initiates the process after evaluation of the district's needs.
2. May appoint a building committee (see below).
3. Works with the administrative and instructional staff and students, as well as lay citizens, in establishing educational specifications for the project.
4. Keeps the public informed of school needs and the progress made on construction. The educational specifications may be developed by a curriculum committee under the general supervision of the Superintendent of Schools acting as the board's executive officer. Please refer to Chapter IV, "Educational Specifications".
5. Engages professionals, such as an educational consultant, early in the building program to aid in long-range planning, and an architect at a later stage to prepare drawings and contracts.
6. Approves school sites, plans and drawings, evaluates and awards bids, signs the necessary contracts, supervises the entire process, and approves the completed project.

D. SUPERINTENDENT OF SCHOOLS AND STAFF - - The Superintendent of Schools is the executive officer of the school board. In a building program it is his duty to provide and coordinate capable assistance and services to the school board. The superintendent and his staff will:

1. Utilize the assistance of principals, teachers, students, and nonprofessional personnel in the total building program.
2. Provide the school board with facts to assist its members in the multiple decisions a building program entails.
3. Convey to the architect a clear, concise statement of the educational specifications to be fulfilled in the building.
4. Assist the school board in presenting the program to the public.
5. Develop a financial plan for costs of construction, preparing bond issues, etc.

E. SCHOOL BUILDING COMMITTEE - - In New Hampshire it is a commonly accepted practice to appoint a building committee to work with the local school board in a building project. In a school building program the building committee assists the school board in making long-range plans and assures that these plans are translated into a building program. The committee - its size determined by the scope and complexity of the project - is usually composed of one or more school board members and citizens from various segments of the community. It should be emphasized that the building committee in regular school districts is advisory only, and all plans and specifications for school building must by approved by the school board. This is also true in cities, except that here construction is done under the direction of a joint building committee, chosen in equal numbers by the city council and school board. Selection of school sites in both regular districts and cities must also be approved by the school board. Please review RSA 199:1-2-3.

In general, the building committee performs the following functions:

1. Keeps itself informed of the latest trends in education and construction to provide guidance in carrying out the educational specifications.
2. Assists in the formulation of educational specifications, taking into account the needs of the district.

3. Assists in the selection of school site and architect.

4. Reviews drawings and specifications in order to make recommendations.

5. Assists the school board in keeping the public informed of the project's progress.

CATEGORY TWO

A second category of participants includes agencies and individuals from the community, whose direct involvement in the planning process is essential to the building program's success.

A. PLANNING AND ZONING BOARDS - - The multiplicity of problems that beset today's urban or rural community has resulted in widespread acceptance of the necessity for long-range planning in all areas. Planning boards and commissions have been formed for orderly municipal development. Such groups should be involved in planning school building programs. There may be a subcommittee on planning for school needs. Local planning and zoning regulations must be observed in planning construction and selection of site. Most important, planning for schools cannot be carried on in a vacuum; educational services must be integrated with the full range of public services, with regard to cost and total development of the community. Overall planning for communities can produce effective results, and the educational planner must be a prominent partner in the process. He has a twofold role: he must be acquainted with the other agencies, and he must make community planners cognizant of school needs and problems. Planning boards and agencies are formed to deal with the following, each of which affects the educational system:

1. Renewal of urban centers.

2. Population growth and movement.

3. Industrialization of the community - - potential for fiscal support.

4. Development of highway systems (local, state, and interstate).

5. Availability of land and sites.

6. Building codes and zoning regulations.

7. Providing for future educational needs.

8. Community relations.

B. THE SCHOOL COMMUNITY - - Teachers, administrators, counselors, students, nurses, custodians, and other noninstructional personnel should be consulted regarding the following aspects of a building program:

1. Establishment of educational specifications.

2. Survey of present and future needs of the district.

3. Formulation of long-range educational goals.

4. Advice on features to be included in the building in accordance with latest trends and special needs.

5. Evaluation of present methods of instruction and recommendations for possible improvements.

6. Liaison between school and community.

C. THE COMMUNITY AT LARGE - - The community should be kept informed at every stage of the project. Articles in the press, availability of school board members and administrative personnel to inform interested citizens, and public hearings are ways to maintain two-way communication throughout the planning and construction process. Suggestions from the public should always be given consideration by those in charge of planning, and the community should be informed of the attention given these

CATEGORY THREE

It may seem an almost impossible task to bring together the ideas of the numerous agencies, committees, and individuals listed above into a cohesive program that will achieve the desired goals. This is the function of the third category of participants in the planning process, i.e., the professionals. They are selected and placed under contract by the school board for the sole purpose of bringing the project to fruition.

A. THE EDUCATIONAL CONSULTANT - - The growing complexity of school planning often requires the services of an educational consultant to develop a master plan for the district. Educational consultants may be employed by the district to work with the committee, school people and architect. Under these circumstances he is paid by the district. Architectural firms are now adding such professionals to their staffs in which case the cost would be a part of the architect's fee. The district-employed consultant may be a member of a firm specializing in this work or may be an individual professional. The professional consultant has wide expertise in the educational field, which he applies to the specific needs of the district. He can perform the following services:

1. Survey the present situation in the district.
2. Formulate future educational needs.
3. Develop alternative plans to fulfill these needs.
4. Analyze and evaluate each alternative response.
5. Work with the school board and/or building committee at all stages.
6. Help in presenting the program to the public.
7. Continue after completion of the master plan, to evaluate the implementation of the educational philosophy and objectives of the district. (See Chapter III for additional information.)

B. ARCHITECT - - As soon as the needs of the district have been determined, an architect should be retained. It may be advisable to employ this professional from the inception of the building program. IT IS A POLICY OF THE STATE BOARD THAT A REGISTERED ARCHITECT MUST BE EMPLOYED TO DESIGN THE PLANS OF THE PROPOSED BUILDING IN ORDER THAT THE PROJECT BE ELIGIBLE FOR STATE BUILDING AID. According to statute (RSA 310), a person must be a registered architect in order to practice in New Hampshire. The architect's contribution to the building program follows:

1. Advice and assistance in the selection of a site.
2. Assistance in determining the physical requirements of the project and developing preliminary budgets.
3. Preparation of preliminary sketches and studies incorporating educational specifications.
4. After review of preliminary sketches, prepares detailed drawings, plans, specifications, and contracts for the project.

5. Architects are responsible for conformance with state and local codes.

6. Assistance in obtaining State Department of Education approval for building.

7. Preparation of necessary forms and information to advertise the project for bid, assistance in bid opening, advice to the committee on awarding the contract.

8. Inspection and administration of the construction phase of the project.

9. Certification of payments to the contractor, advice as to final acceptance of the building.

10. Authoritative, professional presentation of the building program to the public, especially with regard to costs and details of construction.

C. ENGINEER - - The professional engineer can assist the architect and committee in many aspects of the building program, including heating and ventilation, the electrical system, plumbing, site selection and development, etc.

D. EQUIPMENT CONSULTANT - - Many committees and school boards employ an expert to select and secure the equipment for building programs. This is particularly true in large projects. To achieve desired educational goals for the building, proper equipment must be purchased. Consultants in this field can provide valuable assistance in writing specifications, in the bidding process, purchasing and installation of equipment.

Architects often have such a professional on their staff, but it is becoming common for the equipment consultant to work as an independent resource to the committee.

GUIDING PRINCIPLES FOR A SCHOOL BUILDING PROGRAM

Most schools are planned and designed for use over many years. To provide long-term usefulness to the district and to justify the expensive investment in a school plant, the following principles are suggested as guidelines to a committee:

1. **FLEXIBILITY** - - Modern technology makes available a wide choice of versatile construction materials and methods so that a building will be adaptable to future changes in curriculum and teaching methods.

2. **DURABILITY** - - Buildings should be constructed of durable materials that need not be necessarily expensive. On the other hand, an initial higher cost of good sound materials may be offset by lower operational or maintenance expense.

3. **EXPANSIBILITY** - - The building design should provide for possible future expansion and additions. Original construction should not be so permanent to preclude changes in the structure.

4. **ACCESSIBILITY** - - Buildings should be designed to allow easy flow of traffic. This principle applies not only to vehicular traffic (accessibility to public thoroughfares and ample provision for parking), but also to the establishment of good traffic patterns within the school.

5. **ENVIRONMENT** - - Aesthetic values must be considered in planning the total school environment. In order to provide the best possible learning environment, surroundings must be comfortable, pleasing, and safe.

TIMETABLE FOR PLANNING SCHOOLHOUSE CONSTRUCTION

To insure orderly progression of the planning process, school boards or building committees may find the following useful:

1. Basic analysis of needs.
    a. Evaluation of existing plant facilities.
    b. Pupil enrollment projection.
    c. Determination of the educational philosophy of the district, evaluation of the instructional program.
    d. Analysis of financial status.

    Note: If an educational consultant is to be engaged, selection should be made at stage.
2. Dissemination of information at the local level through a coordinated public information program.
3. Development of detailed written educational specifications (See Chapter IV for suggested outline.)
4. Attainment of funds for planning purposes.
5. Selection of architect.
6. Selection of school site with the assistance of the architect and other specialists.
7. Development of preliminary drawings by architect in accordance with educational specifications.
8. Review of preliminary drawings with State Department of Education following approval of local school board.
9. Complete detailed specifications drawn up for furnishings and equipment for use in the building.
10. Securing of local authorization of funds.
11. Preparation of working drawings to be submitted to the State Department of Education for final approval. Prior approval of other state agencies secured before submission to State Department of Education.
12. Completion of necessary forms and applications prior to submission of plans for bid.
13. Advertisement of construction documents for bid, receipt and evaluation of bids, award of contract.
14. Completion of site development and building construction, including furniture and equipment.
15. Dedication and presentation of building to public and other officials.

CHAPTER II - LEGAL REQUIREMENTS

Legal procedures must be followed if a school building project is to be approved for building aid. Projects must meet minimum requirements under New Hampshire statutes, regulations, and basic building codes. Many municipalities have other building requirements which also have to be met.

Listed below are the agencies (state and local) designated by statute or regulation to ensure that building plans and specifications meet the requirements for approval.

1. STATE BOARD OF EDUCATION

a. Approves plans and specifications of building projects to qualify for building aid. RSA 198:15-a through h. (See Chapter XV of this manual for steps necessary for approval.)

b. Plans and specifications must meet provisions of RSA 155-a: "Construction of schools which have more than one hundred occupants will conform to the latest National Building Code", and the Life Safety Code, 1973 Edition.

c. Enforces provisions of RSA 155:8-a: "Making Buildings Accessible to, and Usable by, the Physically Handicapped." (See Page 9)

Address: State Board of Education
State Department of Education
State House Annex
Concord, N.H. 03301

2. NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION

Two of the most important factors to be considered in selection of a school site are the availability of a water supply and means of sewage disposal. The New Hampshire Water Supply and Pollution Control Commission is responsible for enforcing the statutes relating to these two areas. The following guidelines should be used by the committee and/or architect:

a. School sites, when possible, should be located where a public sewage disposal system is available.

b. If a public sewage system is not accessible to a school site THE COMMISSION SHOULD BE CONTACTED AS SOON AS POSSIBLE, ESPECIALLY BEFORE THE SITE IS SELECTED.

c. As provided under Statutes RSA 148:25 and 149-e, plans for any proposed system must be submitted at least thirty days before construction is contemplated to the Water Supply and Pollution Control Commission for review and approval. Approval must be obtained prior to the start of any construction.

d. All plans submitted for review must have been prepared by an engineer registered to practice in the State of New Hampshire.

Address: New Hampshire Water Supply and Pollution Control Commission
105 Loudon Road
Concord, New Hampshire 03301

3. SAFETY SERVICES DIVISION

Each set of drawings for building projects must be submitted to the Safety Services Division for review and approval. If they meet the requirements, the State Fire Marshal will forward a certificate of approval to the local school board and copy to the State Department of Education.

Mailing Address: Division of Safety Services
State Office Building
85 Loudon Road
Concord, New Hampshire 03301

Location: Capitol Shopping Center
Concord, New Hampshire 03301

4. DIVISION OF PUBLIC HEALTH

The Division of Public Health publishes a code for sanitary food conditions and, in conjunction with the Department of Education, sets standards for health conditions in school buildings.

Address: Division of Public Health
61 South Spring Street
Concord, New Hampshire 03301

5. BOARD OF REGISTRATION FOR ARCHITECTS

By statute one must be registered to practice architecture in the State of New Hampshire. Also, by policy of the State Board of Education, all building plans and specifications must bear the stamp of a New Hampshire registered architect if the project is to qualify for building aid.

Information may be obtained from the Board.

Address: Board of Registration for Architects
Andrew C. Isaak, Secretary
530 Chestnut Street
Manchester, New Hampshire 03301

6. DEPARTMENT OF LABOR

"The Department of Labor administers statutory requirements relating to working conditions, conditions of employment, and minimum wage rates. New Hampshire Statutes provide that the department shall establish a schedule of minimum wage rates for school construction projects when a contract is in excess of $500,000. The statutes also provide for an appeal procedure to be followed if a school board believes that the minimum wage rates do not represent the prevailing rates in the area. It is the responsibility of the school board to request the issuance of a wage schedule, and it would be helpful if the results of a local survey of prevailing wage rates accompanied the request."

The Labor Department also oversees the installation and inspection of boilers and elevators.

While the Occupational Safety and Health Act (OSHA) of 1970 does not apply directly to school districts at this time (6-1-75), the provisions of the act may affect the construction phase of a building. It is likely that some form of OSHA standards may be implemented in the future.

Address: Department of Labor
1 Pillsbury Street
Concord, N.H. 03301

7. DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

The Department of Public Works and Highways should be consulted regarding roads leading to and from the site, as well as drainage of surface water from the area, particularly when these factors effect existing highway systems.

Address: Department of Public Works and Highways
State Office Building
85 Loudon Road
Concord, N.H. 03301

8. RSA 155:8-a - MAKING BUILDINGS ACCESSIBLE TO, AND USABLE BY, THE PHYSICALLY HANDICAPPED

RSA 155:8-a, passed by the General Court in 1965, states that no building can be constructed if it is to be used by the public, and which shall be paid for in whole or in part by state, county, or municipal funds, unless the building and facilities are accessible to, and usable by, the physically handicapped. The statute requires that the specifications of the American Standards Association, A177.1-1961 be met as well as requirements listed in the statute itself. The enforcement of this statute where state school funds are utilized is the responsibility of the State Board of Education. An opinion from the office of the Attorney General, dated October 1, 1969, states the specifications of the American Standards Association, A117.1-1961 must be complied with in full.

These standards were originally established by the American Standards Association (now named American National Standard Institute) in bulletin A117.1-1961 (R1971). Copies of this bulletin are available upon request from the State Department of Education. Each school building committee and/or architect should have knowledge of these requirements.

a. The provisions of the statute pertain to new construction, including additions to existing buildings.

b. All buildings, single or multiple story, must have at least one entrance provided with a ramp, or an entrance at ground level.

c. Multiple story buildings (two or more) must be designed to provide a ramp or an elevator between floors. This includes split-level construction which makes it necessary to go from one level to another to use all facilities, or an exterior covered ramp used to enable people to go from one floor level to another must be enclosed.

d. A ramp or elevator is required for an addition to an existing building if said addition is more than one story. The addition must be designed so that the first floor level of the addition and existing building are the same, or the floor level of the existing building can be reached from the addition by a ramp or elevator.

e. When ramps are used to meet the requirements of RSA 155:8-a, the rise must not exceed one foot in each twelve feet, and it must have a non-slip surface.

f. One girl's and one boy's toilet of sufficient size to accommodate wheel chairs must be provided in each new project. These toilets are to be equipped with grab bars.

g. One drinking fountain must be installed in each new project for the physically handicapped.

9. PERFORMANCE BONDS RSA 447:16 and 16-A

477:16 Bond Required. Officers, public boards, agents or other persons who contract in behalf of the State or any political subdivision thereof for the construction, repair or rebuilding of public buildings, public highways, bridges, or other public works shall if said contract involves an expenditure of ten thousand dollars, and may if it involves an expenditure of less amount, obtain a security bond in an amount at least equal to the contract price.

Purpose. The purpose of this section which requires those who contract with the State or any political subdivision thereof for the construction of public works and buildings to furnish a bond conditioned on payment by the contractors and subcontractors for all labor, material and equipment used in carrying out the contract is to protect those who furnish such labor, material, and equipment including materialmen of a subcontractor. General Electric Co. v. Dole Company (1964) 105 NH 447, 202 A2d 486.

See statute regarding the procurement of the bond when State, local and federal funds are involved.

10. AVAILABILITY OF MEAL TO EVERY PUPIL

RSA 189:11-a, as passed by the General Court in 1973, requires that each School Board make a meal available during school hours to every pupil under its jurisdiction. Waivers may be granted by the State Board of Education to those Districts that do not make meals available, but no waiver shall extend beyond September 30, 1979.

The requirement in the statutes implies that each school building have a facility or way where meals can be made available to students in that building. This means that any District constructing a new school building or renovating an existing building prior to September 30, 1979 shall include a facility where meals can be served to students, or will certify in writing how the District will meet the requirements as set forth in RSA 189:11-a.

11. CONSTRUCTION PERMIT

155-A:2 Permit Required. Before starting new construction of schools, halls, theatres or other public buildings the person responsible for such construction shall obtain a permit signed by the board of selectmen, after their due consideration of any written recommendations of the fire chief. (See Chapter XII regarding standards.)

12. INSURANCE SERVICES OFFICE OF NEW HAMPSHIRE

School boards, building committees, and architects should confer with the Insurance Services Office of New Hampshire on matters pertaining to the design of a building, materials to be used, safety factors, especially with regard to making a structure fire resistant. All these factors influence the insurance premiums of the school district, with the resulting impact on future budgets.

Address: Insurance Services Office of New Hampshire
Loudon Road,
Concord, N.H. 03301

13. LOCAL PLANNING AND ZONING BOARDS

School planners should be aware of the requirements of local building and zoning codes and regulations. Many local codes are more restrictive than the National Building Code; certain permits may be required, and other conditions established by the local fire chief or district must be fulfilled.

Most cities and large towns have building inspectors who are responsible for reviewing drawings to insure conformance with local building requirements. School project planners in such localities should be in contact with this official early in the process.

CHAPTER III - THE ROLE OF THE PROFESSIONAL

The professional renders invaluable assistance to the school building committee and/or the school board to assure smooth progress of the project from inception to completion. This section concentrates on two professionals, the educational consultant and the Architect. This does not mean that the services of other professionals (such as legal counsel, professional engineer) will not be required at some stage of the project, but these two play such an integral part in the planning and execution of any school building program that an outline of their functions may be helpful to planners in selecting competent and professional advisers.

EDUCATIONAL CONSULTANT

Though not mandatory for a school board to engage an educational consultant, it is highly recommended in districts where little long-range planning has taken place. If a consultant is to be hired, it should be done as soon as possible after the school board decides to initiate a building program. The analysis of educational needs in a school district is a complicated and time-consuming project, to which an independent team of consultants can bring both objectivity and specialization. The major elements of the survey are as follows:

A. Goals and aspirations - - dimensions of the effort.

B. Nature of the students to be educated.

C. An educational plan and specifications.

D. Enrollment projections.

E. Space requirements.

F. Analysis and evaluation of alternatives.

Upon completion of the survey, the school board or building committee will have a master plan based on the consultant's specialized knowledge in combination with an intensive study of local conditions and needs.

THE ARCHITECT

To qualify for state building aid, the plans and specifications of a proposed school building must be prepared by an architect registered in New Hampshire. The following information regarding this role is intended to help the committee select a qualified person:

SERVICES RENDERED BY THE ARCHITECT

The architect's services are personal, and he offers his ideas, skills, imagination and advice to the committee. His services include:

1. Conferences - - It is the responsibility of the school board, with the assistance of the superintendent of schools, his staff, and frequently with the advice of an educational consultant, to prepare information regarding future educational needs, the curricula to be offered, the specialized facilities to be provided, etc. Conferences between the educational personnel and the architect provide him with the desired goals and objectives. The teamwork resulting from these preliminary conferences often determines the quality of the final project - - the new school plant.

2. Site Inspections - - The architect works with the building committee to inspect sites under

consideration and to assist in comparative evaluation of possible sites. He gives advice on topography, orientation, drainage, size and shape, while the building committee concerns itself with transportation costs, land values, and the direction of community growth.

3. Preliminary Studies - - *The architect will present his recommendations in the form of schematic drawings.* These preliminary sketches and specifications establish the character of the building and must be reviewed to insure the finished structure will be the best solution to the district's problems.

4. Preliminary Cost Estimates - - These estimates are approximations since final decisions regarding structure, equipment, and materials are not made at this stage. Allowance must also be made for the fact that it may be several months before a building program is put into operation and costs may well be higher at that time. The architect's estimates, however, are essential in preparing budgets and determining if project costs are within the district's ability to pay.

5. Working Drawings and Specifications - - The architect's working drawings and specifications constitute the construction documents on the basis of which bids are secured and the structure erected. The drawings must include a site plan, floor plans, building elevations, sections, structural system, electrical, plumbing, heating and ventilation systems. The specifications describe the materials to be used and the quality of workmanship required from the contractor.

6. Contracts and Bidding - - The architect advises on the bidding procedures, helps to evaluate the bids, and assists in the preparation of contract documents, such as proposal, contract and bond forms, etc. Though there are other ways to bid, the American Institute of Architects and the Association of General Contractors favor the "single bid" system.

7. Supervision - - The architect assumes general supervision of the project, including the checking of shop drawings, approval of materials, periodic observation of the work, expedition of progress.

8. Administration - - It is the architect's responsibility to keep complete accounts of the contractor's work, to issue certificates of payment for money due the contractor, and to provide general administration of the business aspects of a project until final acceptance of the building by the school district.

9. Owner's Agent - - Throughout the period of construction, the architect acts as the owner's agent, thus relieving the building committee and the superintendent of many time-consuming details.

In addition, the architect gives advice on such matters as color selections, choice of equipment and furnishings, maintenance operations, and insurance problems.

When Should the Architect be Employed?

From the preceding description, it is apparent that selection and employment of an architect take place at an early stage in the planning process, before a site is selected and other final decisions are made regarding the building. The school district should appropriate sufficient funds to cover the cost of a preliminary study and the architect's fee.

Selection of an Architect

1. Direct Selection - - When there is general agreement among the members of a school board or committee that an architect, well known to all of them, is the only person for the job, and

when he is hired forthwith, it is known as direct selection. However, for all its advantages of speed and familiarity, this procedure may result in overlooking a better qualified architect.

2. Comparative Selection - - This frequently-used method involves selection from among several candidates who are given equal opportunity to present evidence of their qualifications. Committee members will have to spend considerable time interviewing candidates, checking out qualifications, and evaluating and comparing results. During the interviews the selection committee should weigh the experience and competence of the mechanical and electrical engineers employed by the architect.

The candidates retained for final consideration should be interviewed individually. It is important that each be given the same facts and asked the same questions.

Whenever possible, the committee should visit schools designed by the candidates. Visual inspection, and discussion with those using the facility, will provide valuable background information for reaching a decision.

3. Competitive Selection - - This method may be used for larger projects. A formal competition is conducted in accordance with procedures by the American Institute of Architects. This method may uncover talent that might otherwise be overlooked. Because it is generally cumbersome and time-consuming, however, it is seldom used.

Professional Ethics

The architect's code of ethics is contained in the "Standards of Professional Practice" issued by the American Institute of Architect . Too long to be included here, its essential features are as follows:

1. The profession of architecture calls for men of integrity, with business aptitude and artistic and technical ability. The architect's responsibilities cannot be discharged properly unless his motives, professional conduct, and ability command respect and confidence.

2. The architect receives remuneration for his professional service only and should not place himself in a position to receive commissions or allowances from any other source.

3. An architect may propose the services he is able to perform, but shall not, except under unusual circumstances, offer his services without compensation, and shall not submit free sketches.

4. An architect shall not enter into competitive bidding against another architect on the basis of compensation. He shall not use donation or misleading information on cost as a device for obtaining an advantage.

Architectural Fees

There is no longer a schedule of recommended minimum fees. An architect offers his service at an agreed fee negotiated between himself and client.

Contract Between Owner and Architect

Any undertaking involving expendature of public funds should be conducted to avoid misunderstandings, disagreements, and possible legal actions. A written contract with the architect accomplishes this objective. The A8A's Standard Forms of Agreement are the most frequently used; copies may be secured from any architect. Building committees and school boards should review these documents carefully with legal counsel before entering into a written contractual agreement.

Services of Professional Engineers

Professional engineers, by statute, must also be registered in the state, and drawings that are a product of their work, must bear their stamp. Listed below are some of the responsibilities of the professional engineer:

1. Civil - Surveying of site for plot plan.
2. Electrical - Power, lighting, clock, program, fire, smoke alarm and communication systems, as well as emergency safety systems.
3. Sanitary - Plumbing.
4. Mechanical - Heating, ventilation and air-conditioning and sprinkler systems.
5. Structural - Steel, concrete, framing, design, etc.
6. Others - As required.

Most engineers in the state are indipendent and are engaged by architects when needed in a building program. Larger architectural firms often maintain their own engineering departments.

Project Representative (Clerk-of-the-Works)

At the owner's request, the architect will provide a full-time project representative, sometimes called a clerk-of-the-works, to assist him in carrying out his responsibilities at the construction site. While the architect makes frequent periodic inspection of the progress of the work, this full-time representative is on the job throughout the construction period.

The responsibilities and authority of the project representative are described in an AIA document entitled "Suggested Instructions to Full-Time Project Representatives." A copy may be secured from the architect.

The project representative's duties include the following:

1. Acts as liaison between architect and contractor.
2. Observes progress of work and conformance with contract.
3. Observes tests required by contract.
4. Keeps records such as daily diary, log of shop drawings, changes, etc.
5. Reviews requisitions for payment.
6. Advises architect of any special job problem.

The project representative has no authority to order any deviation from the drawings or specifications, or to interpret these contract documents, or to approve material samples or shop drawings.

Although the project representative acts under the direction of the architect, his salary is paid by the owner, either directly or through reimbursement to the architect.

In some situations the clerk-of-the-works is employed by the district solely and his duties are the same or similar to those described above. When a clerk-of-the-works is employed under these circumstances there must be a clear understanding of his relationship with the school board committee, the architect and contractor. If his area of responsibility is not well defined, confusion and conflicts can hinder the orderly progress of the project. This is not a recommended practice as it may cause some strife between the local officials and architect.

Change Order

A change order is written authorization for making a change in the original drawings, specifications, and contract documents. Change orders usually originate in one of the following ways:

1. The owner desires a change in the original conditions of work and requests the contractor, through the architect, to present a quotation on the change.

2. The contractor may request a change due to extra work resulting from conditions not known at the time of bidding.

In either instance the architect obtains the necessary quotation for the additional work or for allowance of work not done. The required forms are completed by the architect and signed by both the owner and the contractor. No change should be made from the original specifications of the job without a signed change order by the owner and the contractor, and work involved in any change, should not begin without a signed change order.

Verbal authorization for change in the work specifications should neither be given nor accepted by either the owner or his representative, the architect, the contractor or his representative.

CHAPTER IV - EDUCATIONAL SPECIFICATIONS

Introduction

Planning a school facility provides a school district with an opportunity to assess its educational philosophy, goals and objectives. Translated into educational specifications, such assessments will state the problem to be solved in terms of facility requirements to improve education within the district.

Written educational specifications are the stepping stones to a successful building program. As defined by the Council of Educational Facility Planners, educational specifications or program requirements are the means by which the educator describes the educational activities and spaces which need to be incorporated in a proposed new or renovated facility. They are written statements that serve as vehicles of communication between the educational sector and the architect.

In writing "ed specs" two points should be remembered: First, the specifications are concerned with the program and the persons to be housed, not the architectural solutions; Second, the educational specifications are written as a single document so one does not rely primarily on discussions, memos, notes, reports and minutes. Subsequent changes made in the educational specifications should also be written and distributed to all concerned parties.

THE CURRICULUM COMMITTEE: The curriculum committee is perhaps best suited to develop the written educational specifications. This committee generally functions as a subcommittee of the building committee, but may be separately organized and report directly to the school board. In all cases the work of the curriculum committee is carried out under the general supervision of the Superintendent of Schools and his staff. Since the educational specifications influence all other aspects of the building program, it is imperative that an effective plan of communication be developed between the curriculum committee and other groups and committees organized to advise the school board on the various components of the building program.

MEMBERSHIP OF THE CURRICULUM COMMITTEE: It is important that the curriculum committee be widely representative of those persons who know best the educational needs of the community. Membership on the curriculum committee will generally include the following:

1. The superintendent of schools and/or his designate.
2. A representative(s) of the school board.
3. A building principal(s).
4. A teacher representative(s).
5. A representative(s) of the student body.
6. A representative from the custodial staff.
7. Citizens that are representative of the community to be served.
8. A curriculum specialist
9. An educational consultant specializing in the planning of educational facilities.
10. The architect selected to design the building.

CITIZEN INVOLVEMENT: The involvement of citizens is a primary responsibility of the curriculum committee. Citizen involvement is particularly essential if the new facility is to serve as a "community school". In writing the educational specifications, the curriculum committee should actively seek suggestions from those various groups and agencies that will share the facility with the educational users.

WHAT TO INCLUDE IN THE EDUCATIONAL SPECIFICATIONS: The following information outlines the format for developing the written educational specifications to be submitted to the State Department of Education for project approval. While the general format may vary depending upon the size and nature of the project, all items listed below must be included to constitute an acceptable set of educational specifications. The reasons for excluding any item(s) must be in writing and signed by the Superintendent of Schools. Such documentation shall be attached to the written specifications.

I. The Community to be Served:

   A. Physical characteristics.

   B. Socioeconomic characteristics.

   C. Brief description of existing educational system supported by the community.

II. The Pupils to be Served:

   A. Organizational pattern (grades or ages of pupils to be housed in the new facility and how such a pattern fits into the overall organization of the school district).

   B. Number of pupils to be housed (including expected opening enrollments and a minimum five-year projected enrollment).

III. The Educational Program to be Housed:

   A. Philosophy of education (a general statement as to what the community believes important concerning the education of all its young people).

   B. Goals of the elementary, intermediate or high school program (specific statements about the desired learning outcomes for pupils at the various organizational level(s) to be served by the new facility).

   C. Special needs of pupils to be served by the new facility (e.g., vocational needs, health and safety needs, needs of the talented and gifted, needs of the handicapped, etc.).

   D. Staffing needs and special materials and supplies necessary to carry out the instructional program.

IV. General Environmental Considerations for the Facility:

   A. Visual.

   B. Heating and ventilation.

   C. Acoustical.

   D. Aesthetic.

V. Instructional Areas: (The following items must be considered for each category of space. The categories may be by academic discipline, by age group, etc.)

A. Objectives (desired learner outcomes).

B. Instructional and learning activities to be housed.

C. Persons to be housed (expected minimum and maximum numbers).

D. Special furniture and equipment needs to be housed.

E. Special environmental requirements or considerations (e.g., accoustical).

F. Instructional space requirements (computed in net square feet of instructional space for each subject area, classroom, etc.)

G. Cooperative or joint efforts with other instructional areas.

H. Spatial relationships (e.g., curriculum grouping).

VI. Supportive Areas: (The items listed in Section V above must be considered in each of the following support areas where applicable).

A. Staff.

1. Planning - working - conference.

2. Dining.

3. Relaxation.

B. Administration.

1. Public reception.

2. Conferences.

3. Office(s).

4. Secretarial.

5. Records.

6. Data processing.

7. Communications.

8. Time system.

9. Alarm system.

C. Student Services.

1. Guidance and counseling.

2. Health clinic.

3. Student activities.

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4. Student store.

5. Home room (if applicable).

6. Lockers.

7. Informal gathering area(s).

D. General or Service Areas.

1. Food service (hot or cold cafeteria: central and satellite kitchens).

2. Circulation (lobbies, corridors and stairwells, etc.).

3. Maintenance and operational (floor and wall finishes within various areas, receiving, storage, custodial, heating, cooling).

4. Toilet facilities.

VII. Community Programs to be Housed.

A. Types of programs (The items listed under Section V, above, must be considered in each community program where applicable).

1. Educational (adult).

2. Recreational.

3. Cultural.

4. Social.

B. Community agencies or services to be housed.

C. Special facilities to be provided.

D. Shared facilities with "regular" school program.

E. Evening, weekend and summer use.

F. "Zoning" of building.

VIII. Site Considerations.

A. Size, location and physical characteristics.

B. Ingress and egress features.

C. Circulation on the site.

D. Bus loading and unloading provisions.

E. Parking, drives and walkways.

F. Insulation from surrounding areas.

G. Outdoor education programs (See instructional areas - science).

H. Physical education programs (See instructional areas - physical education).

I. Community recreation programs.

CHAPTER V - SITE SELECTION

Selection of a suitable site for the new school is one of the first steps toward the realization of the plans formulated during the preliminary stage of the project. The site chosen plays an important part in determining how well the final structure will meet the educational, aesthetic, and technical requirements. Criteria for selecting a school site must be broad and sufficiently flexible to make possible variations in the size and type of building to be constructed, to fulfill the needs of the educational program, and to make allowance for future expansion and potential changes in curriculum or teaching methods. School planners must work closely with the architect, community planners, engineers, and other professional consultants before a final choice is made.

The State Department of Education should be consulted before steps are taken to acquire a site and the Department will assist the committee in the selection and evaluation of areas under consideration. Other advisory agencies whose services should be used by the local committee are the N. H. Department of Resources and Economic Development, the N. H. Soil Conservation Service, the N. H. Water Supply and Pollution Control Commission, the N. H. Department of Public Works, and local planning and zoning boards. Already mentioned is the advisability to retain the services of an architect early in the building program. His professional training and experience will be invaluable in the process of site selection, and his early involvement in the project will enable him to do a better job of designing a building adapted to the site and the educational needs of the community.

The committee faces a serious responsibility in choosing a site; not only must it be suitable for present needs, but it must provide for future increases in enrollment and changes in the educational program. Sobering thoughts for the committee to consider are the growing scarcity of available land, steadily increasing costs, and ever more stringent zoning regulations that may well make this one of the last opportunities for selecting adequate acreage for school needs.

STANDARDS FOR SITE SIZE

The site must be large enough to meet immediate needs and present enrollment, the planned educational program, and parking space. There should also be sufficient land for expansion. To determine this last factor, accurate enrollment projections should be made. In order to meet the requirements for building aid, the site must be large enough to accommodate the projected enrollment for the district and the educational program of the facility. Other considerations are the size of the building, landscaping around the building, roadways, parking and service areas, playgrounds and athletic fields.

THE FOLLOWING WILL BE THE MINIMUM SITE SIZE APPROVABLE FOR BUILDING AID FOR NEW CONSTRUCTION:

ELEMENTARY SCHOOL:	**FIVE ACRES OF USABLE LAND, PLUS ONE ADDITIONAL ACRE FOR EACH 100 PUPILS TO BE IN ATTENDANCE AT THE SCHOOL.**
MIDDLE SCHOOL OR JUNIOR HIGH:	**TEN ACRES OF USABLE LAND, PLUS ONE ADDITIONAL ACRE FOR EACH 100 PUPILS TO BE IN ATTENDANCE AT THE SCHOOL.**
SENIOR HIGH SCHOOL:	**FIFTEEN ACRES OF USABLE LAND, PLUS ONE ADDITIONAL ACRE FOR EACH 100 STUDENTS TO BE IN ATTENDANCE AT THE SCHOOL.**

School districts planning facilities for a different organizational pattern from the one above (for instance, K-6, 7-12) should consult the State Department of Education regarding the number of acres required for approval. If land is owned by the district, town, or city, adjacent to or in proximity to the school site under consideration, this acreage may be included in the minimum number of acres required, subject to approval by the State Department of Education.

Exception to Size of Site Requirement

Whenever a community has a school site which does not meet the new space requirements outlined above for either a new plant or an addition to an existing building, the School Board may appeal to the State Board of Education for an exception in the following manner:

1. Prepare a program utilization plan for meeting the space requirements of a school. Include such information as the daily schedule for using out-of-door play areas, gymnasium indoor areas, other municipal playing fields, the municipal pool, recreation center, equipment available and use of facility.

2. Town and city planning board information relative to school sites, playground areas, and long-range plan for the area.

3. Include long-range plan for the use of this school property, any possible reorganization of school system and any future or preliminary plans for plant expansion, i.e., swimming pool, corrective gymnasium or additional paved playing area.

4. Supply pertinent cost data relative to land values, availability of adjoining property and possible abandonment of adjacent streets to enlarge school site.

BUILDING AID FOR SITES AND SITE DEVELOPMENT

It is the policy of the State Board of Education to approve building aid for the purchase and development of school sites. **HOWEVER, IF A SITE IS PURCHASED PRIOR TO A BUILDING PROJECT, AID WILL NOT BE PAID ON THE PURCHASE UNTIL IT IS VOTED THAT A BUILDING BE CONSTRUCTED ON THE PURCHASED SITE.** The aid paid on the site purchase is based on the total cost of the land, multiplied by the percentage to which the district is entitled, divided by the number of years for which bonds are issued to finance the building project.

FACTORS TO CONSIDER WHEN SELECTING A SITE

1. **QUALITY OF THE SITE**

    a. The site should be suitable both in size and shape for present and anticipated enrollment.

    b. There should be as few hazards as possible, i.e., traffic, disturbing noises, smoke, dust, odors, power lines, etc.

    c. The site should be as free as possible from surface, overhead, or underground utilities, rights of way and easements.

    d. Test borings should be made prior to the acquisition to determine the feasibility for construction, the necessity of pilings, or if special construction is needed.

    e. While level sites are usually more economical, buildings and outdoor areas can be designed on multiple levels to offset some topographical handicaps.

    f. Consideration must be given to the availability of electrical power. The power company should be consulted early in the selection of a site.

2. **ACCESSIBILITY**

   a. The site should be easily accessible to both the school population and the community.

   b. There should be ample space for on-site parking and off-street loading and unloading of buses.

3. **LOCATION**

   a. If at all possible, the site should be located so that it can be served by municipal sewer and water systems.

   b. **IF ON-SITE SEWAGE DISPOSAL AND/OR WATER SUPPLY SYSTEMS WILL BE REQUIRED, THE NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION SHOULD BE CONSULTED EARLY IN THE PLANNING PROCESS SO THAT ITS STAFF MAY AID PROFESSIONAL ADVISORS IN EVALUATING THE SITE LIMITATIONS.**

      (THIS SHOULD BE DONE BEFORE THE PROPERTY IS ACQUIRED)

   c. When possible, a site should be near other educational, recreational and cultural institutions.

   d. The site should be located so as not to be affected by future industrial and commercial expansion.

4. **ZONING AND PLANNING REGULATIONS** must be considered.

5. **AESTHETICS** - - Pleasing surroundings provided by the site will enhance the educational experience for young people.

6. **COST** - - The purchase price and prospective development expenses must be evaluated carefully, especially in light of increasing costs and the diminishing availability of land.

TEST BORINGS

It is strongly recommended that test borings be taken before any choice of site is made. These borings will indicate if it is practical to build on the site and will also be helpful in choosing the best place on the site to locate the school. If it is impossible to get test borings prior to purchase, every effort should be made to determine the subsoil condition and to make a comprehensive site survey early in the planning stages.

OTHER CONSIDERATIONS

The choice of site will be greatly facilitated by the use of aerial, topographical, and soil conservation maps. Careful study of these maps may disclose drainage, sewage, subsoil, and water problems as well as reveal possible sites in areas previously considered unusable. Power companies should be asked to provide maps of proposed power lines. The Highway Department can provide help not only in locating a school with regard to existing and projected new roads, but also in estimating costs for any new roads that may be necessary for the project.

School sites can no longer be viewed merely as a place to locate a building. Sites have a more important role in the total school and community picture and those involved in the selection should consider the following before making a final decision:

1. Will the site offer an opportunity for outdoor educational activities?

2. Does the topography of the site allow ample room for recreational and physical education activities for the entire school enrollment?

3. Will the site provide opportunity for educating the students in the conservation of natural resources on the site or in the immediate area?

4. Can the site be used to provide means of educating children in ways of combatting pollution of our natural resources?

5. Is the site located favorably so it can be integrated for use with the community recreational activities and functions?

When a definitive choice and size of the site has been determined, boundaries must be established prior to actual purchase. Final acquisition of the land should be made only after all legal requirements for securing the site have been met. The deed of sale must be properly recorded. It is advisable to mark the corner boundaries with standard surveyor's markers, especially if adjacent land is to be purchased at a later date.

This brief survey of the multiple factors to be considered when choosing a school site indicates that a school board or building committee would be well advised to obtain as much professional help as possible, at all stages of the process, from lawyers, architects, engineers, and other qualified consultants.

CHAPTER VI - SCHOOL DESIGN AND CONSTRUCTION CONSIDERATIONS

School design is ever changing and all who participate in the planning of a school building should keep abreast of the latest developments in the field. Ignoring this may mean that the product of the planner's efforts can soon be outdated. This chapter will suggest the nature of some of the changing conditions that influence school design and construction.

The trends of today often become the accepted practices of tomorrow, and as concepts change, it is important that consultants, designers and committees be sensitive to construction trends and practices and adopt those which show promise. "Modular" design and construction, for example, is not new, but the principle of this method has been widely accepted. This type of construction employs repetitive use of an element of design. It may be the repetitive use of a "module" of space where a school is designed and constructed with a series of "bays", each having the same dimensions, or it may be the repetitive use of materials of standardized size. Manufacturers of building materials and components have widely accepted this concept. Windows, brick, plywood, tile, as well as many other materials and equipment are being produced in standardized "modules". It is important that the economies and advantages of this method of design and construction be discussed with the architect.

Prefabricated and pre-assembled elements have also been used much more widely in recent years. For example, prefabricated wall sections incorporating durable exterior faces, effective insulated cores and attractive interior surfaces are readily available. Such units are manufactured off-site or constructed on the ground at the site and then "tilted" into a permanent vertical position. One of the major advantages of this kind of construction is the speed with which buildings can be erected.

The "systems approach" to construction is probably the most sophisticated of the new design developments. All systems are integrated to form a highly efficient whole. Such components as roof sections, ceiling systems, lighting, heating and ventilation, along with other standardized materials have been combined to produce the whole structure. To date the "systems approach" has been handicapped by the lack of volume to justify mass production of components. As needs increase, the future may produce the volume of needed construction to justify the mass production presently lacking.

If a construction project under consideration is extensive, the school board and/or building committee might investigate the use of so-called "construction management" (C.M.) techniques. This involves employment of a construction manager responsible for the overall administration of the project. He may be an architect, or a contractor, or a specialist in management. With the possible exception of large projects, it is advisable to retain the normal separate identities and responsibilities of the architect and the contractor.

ECONOMY IN SCHOOL CONSTRUCTION

With today's rising costs, it is often disheartening to plan new school projects. Funds for building programs are always limited, and it has become increasingly difficult to obtain them. Many aspects of the cost of construction such as timing, material shortages, and using labor costs, are easily controlled.

Since some costs are beyond control, it is extremely important to be aware of those expenditures that can be regulated by good planning. The planning team, educator and architect, by examining the following areas, can get the best educational facility available with the limited educational funds.

a. Space in the building - plan to build what is needed.

b. Quality of material that is selected. Cheap materials are not always economical; on the other hand, expensive materials are not always "quality". A balance should be achieved; one that fits the budget, does not take excessive erection time, solves maintenance and insurance problems, and stays within the desired environmental and educational program.

c. Consideration for future additions. If future additions are expected, better provisions can be made initially in phase one than at a later time. This might mean actual construction or merely advanced planning.

d. Design Control has to do with the shape into which design molds the building. The extent of the perimeter wall, the volume of the building, the maximum use of standard sizes, and items, etc.

e. Amount and extent of exterior development. This is work that is done outside the building line. Again, it is suggested only that which is necessary be done.

There is no magic in good, sound, logical cost economy. Economy simply requires an understanding of the problems, careful analysis, proper techniques, and a logical approach at priority cost targets.

It may be pertinent to quote the following statement by Mr. Harold B. Gores, President of Educational Facilities Laboratories, which appeared in the February 1970 issue of the New Hampshire School Boards Association Newsletter:

"People need to know that the cost of a schoolhouse is only six percent of the total cost of conducting the school through the years of its normal life. Typically a million-dollar schoolhouse has an operating budget which totals about one million dollars every three years. Considering a life of sixty years - - and most schools last that long - - the original cost of the building is only about six percent of the total cost of running the place. As more people come to grasp this ratio in perspective, communities are relaxing about trying to 'save' money by cheapening the original cost of the structure. . ."

The initial cost of materials should be balanced against durability and the cost of maintenance. For example, high-grade materials are more expensive at the outset, but may save thousands of dollars in maintenance over the years. It is also important to ascertain the effect on insurance rates which may result from the use of various materials and equipment. Insurance premiums will no doubt be less for a building constructed of fire-resistant materials and equipped with a sprinkler system. Heating costs will be lowered by adequate insulation. These are but a few instances where savings can be realized by careful study of every component of the building. Some practical suggestions, both general and specific, for achieving economies are presented below. While no single one may save a great deal of money, substantial savings may be realized by using as many as possible.

Thorough planning is the basis for an economical building program. It is important to have sufficient time for a thorough study of each step in the building process and for the preparation of specifications, drawings, etc. by the consultants. In selecting an architect, the committee might employ a candidate who has a reputation for designing economical plants of good quality. Clear lines of communication between the architect, the school board, and the administrator, must be maintained at all times. Changes, delays, and indecisions result in additional costs. The architect and other professionals involved should have a timetable for the project that will give them adequate time for programming, design, preparation of documents, etc., and provide for an orderly progression of events. As plans for the building materialize, the cost estimates should be reviewed periodically. The committee should study codes, regulations, and standards to consider the use of money-saving innovative methods.

There are several specific ways of economizing during the planning stage. The site should be appropriate for the development of an economical building; if land is expensive, a multistory building on a smaller site might prove more economical. If enrollment projections forecast a substantial increase in the school population, it might be wise to consider overbuilding at the outset. The possibility of cooperation between several neighboring communities in planning and construction should be kept in mind. Choosing a time when contractors are not busy may result in lower bids and attract a larger number of bidders. Trends in interest rates should be watched, so that money for the project may be borrowed at most favorable rates.

With regard to the design phase, there are several general considerations that will result in economies, such as overall simplicity in design, minimal use of exterior perimeter walls, and avoidance of large areas of glass. If several schools with similar requirements are to be constructed, it may be advantageous to use the same design for all. The concepts of modular planning, the use of prefabricated assemblies and other techniques discussed earlier in this section, should be considered. It is also important to select a structural system that will permit a quick closing-in of the job, especially in our New England climate. Inside the building, space arrangements should be designed for utmost efficiency, keeping the ratio of gross area to net functional square footage as low as possible; inefficient uses of space as in corridors, circulation space, lobbies, should be kept at a minimum. Wherever feasible, areas should be designed for multipurpose use, at the same time keeping in mind the educational specifications. All mechanical, electrical, and plumbing systems should be easy to control and maintain. If the concept of flexibility is incorporated into the original design, it will result in savings later, should changes have to be made in the structure.

In the preparation of the educational specifications, economies may also be effected by a careful study of the curriculum. Year-round utilization of school buildings for both school and community programs is encouraged, including some possible income-producing usage.

The wide variety of movable equipment and furnishings available in today's market will necessitate close scrutiny by the committee to choose the most economical items which will meet educational specifications, especially if the "action" type of learning described in the following chapter is to be included in the curriculum.

Other general economy-promoting factors are flexible state and local standards and codes. In the area of bidding, all documents submitted to a contractor for bid should be complete, concise, accurate, and free of confusing language that might limit or discourage competition. Bidders should be allowed enough time to develop cost estimates and submit accurate bids.

REMODELING EXISTING BUILDINGS

The decision to renovate or remodel an existing school building must be based on a realistic evaluation of the facilities in the light of present requirements for education. Though school buildings have a life expectancy of fifty to sixty years, people are often reluctant to admit that the schools they attend are obsolete. Some of these older schools have considerable aesthetic appeal, and most of them are symbols of tradition and permanency in the community. An evaluation study may evoke many nostalgic memories, but a realistic appraisal will often show that these same schools are educationally and environmentally substandard. Age alone is not the only factor to be considered in the evaluation of existing buildings; the physical condition and its remodeling potential are also essential factors. Maintenance neglect, upgrading of construction and educational standards all contribute to the obsolescence of a building. It is unrealistic to expect 20 to 30 years additional life from a 40-year-old school without making extensive repairs.

Evaluation of an older building is difficult due to the lack of any fixed scale or standard for measuring its future useful life span. Competent professional architects and engineers should be consulted by the committee to provide guidelines for an impartial analysis of the building that will conform to the needs and specifications of the district. One standard of measurement is cost: most educational consultants and architects agree that new construction is a better solution to a space problem if the cost of renovation is fifty percent or more of the cost of providing new space.

A factor that must be considered in providing space for school needs is the impending decline of school enrollments. This possibility necessitates an in-depth study of the present and future population of the school district. If it can be accurately determined that future enrollments will decline, it might be advisable to renovate and remodel existing buildings. This should not, however, be done in haste. Even though future enrollments might decrease, the conditions explained earlier must be considered, especially in light of the district's educational specifications and the program desired for the district.

THE DECISION TO RENOVATE AN EXISTING BUILDING SHOULD BE BASED ON THE EDUCATIONAL PROGRAM, THE STRUCTURAL SOUNDNESS AND THE COST OF SUCH AN UNDERTAKING.

CHAPTER VII - ENERGY CONSERVATION THROUGH BETTER CONSTRUCTION

NEW FACILITIES

During the next few years energy may well be the architect of the building program. Buildings are said to use about one-third of all of the energy produced, and about forty percent of this is wasted. Planners can share in reducing energy wastage by proper design and structural standards.

WHEN REVIEWING PLANS FOR BUILDING AID APPROVAL PARTICULAR ATTENTION WILL BE GIVEN TO THE ENERGY CONSERVATION DESIGN FEATURES OF THE PROJECT. AS STATED ON THE PAGE PRIOR TO THE FOREWORD AND IN CHAPTER XVI, THE FOLLOWING WAS VOTED BY THE STATE BOARD OF EDUCATION ON JULY 16, 1975:

> **"IT IS TO BE EXPECTED, BEFORE APPROVAL OF ANY SUBMITTED BUILDING PLANS FOR ANY PURPOSE THAT INVOLVES SCHOOL CONSTRUCTION, THAT THE VERY LATEST TECHNOLOGY AVAILABLE WILL BE UTILIZED IN ENERGY CONSERVATION."**

It is the intent of this section to point out that significant savings can be achieved through better materials and methods of construction. Similar savings can also be realized when renovating existing buildings.

Though school construction costs exceed five billion dollars annually, most districts still try to build new schools at the lowest possible cost. Often the savings gained in construction will be lost through high expenditures in the operation and maintenance of the completed building - a fact too often overlooked. Energy savings must be seriously considered because of the energy crisis and the designer must plan for a future based on conservation.

RECOMMENDATIONS CONCERNING BUILDING DESIGN FOR ENERGY SAVINGS

1. Do not exchange short-term minimal savings for long-term maximum gains.

2. Orient the building to take advantage of the natural energy saving features of the site - use trees and other buildings as windbreaks from the winter prevailing winds and storms. Place parking area so that it does not expose building to winter winds nor heat up summer cooling breezes.

3. Shape the building for optimum energy use. (Cubic shape maximizes volume while minimizing surface area).

4. Design the facility on the edge of comfort, use humidity controls and good vapor barriers.

5. Consider burying part of the building to reduce heat losses and air infiltration.

6. Design the building for minimum acceptable exposed wall and roof areas.

7. Use sun to heat the building with south facing windows, and provide thermal curtains or shades during nighttime use, wind and nighttime ventilation to cool.

8. Supervision during building construction is essential to assure best use of building materials. Insure vapor barriers and insulation are installed correctly.

9. Provide proper automatic controls - heat, ventilation, and for some lighting. Make use of natural ventilation when available, exhaust air to leaward direction.

10. Design efficient mechanical systems to cut down overheating and overlightings.

11. Use efficient lighting sources - concentrate light on tasks.

12. Room switching should be designed so unneeded rows of lights can be turned off. (New fixtures provide means to illuminate only partial number of tubes.)

13. Require day/night thermostat control for unoccupied temperature setback.

14. The building gross wall should have a heat loss factor not greater than .20.

    a. The glass area of the wall should not exceed 20% of the total wall area.

    b. Windows generally should be double glazed, thermopane, or combination with night time insulating curtain or panel.

    c. Locate windows advantageously.

    d. Storm doors or vestibules should be used.

15. The building roof, through proper insulation, should have a heat loss factor no greater than .05, for opaque walls the heat factor should be no greater than .06, foundation walls below grade enclosing a heated space shall not be greater than 1.2. Floors to unheated spaces heat loss factor should be .08 or less.

16. The heating system efficiency should drop no more than 10% at 1/2 load.

17. Heating duct air losses should be restricted to 3% of air volume.

18. Hot water and steam lines should be insulated. Install low volume toilet fixtures and shower heads.

19. Restrict ventilation to 3 cubic feet of air per person per minute when outside temperature is below 10 degrees F.

20. Large building heating zones involving multiple rooms should be restricted to 3,000 square feet or less. Heating systems should be able to function without outside air being introduced.

21. Consider use of heat recovery systems that remove heat from the exhaust air to preheat incoming air.

    These recommendations were taken from the following sources:

    a. Bureau of Public Improvements.

    b. Educational Facilities Laboratories, Inc. booklet "Economy of Energy Conservation in Educational Facilities".

    c. Nation's Schools magazine, July, 1974 issue.

EXISTING BUILDINGS

While this manual is planning for new school construction, energy conservation is so important that the committee would be remiss if the topic were omitted from this publication. Much can be done to make existing buildings more efficient, thereby conserving energy and at the same time reducing the operational costs of the plant. A good conservation program starts with a thorough understanding of the school's mechanical systems: heating, ventilation, air conditioning, plumbing and electrical. This is essential regarding buildings already being used in the district and can be evaluated by appropriate officials in the system with the aid of engineers, especially those who design the mechanical systems. For a long-range program it is recommended that districts enlist the services of a reputable consulting engineer specializing in energy-saving methods.

The following recommendations are given to aid school boards and administrators in reducing the amount of energy used in their districts:

a. Plan an on-going energy conservation program for the district.

b. Develop training programs for operational and maintenance personnel. Have working drawings of the energy systems available for maintenance personnel.

c. Monitor energy and training programs continually, especially with regard to efficiency of mechanical systems.

d. If necessary, have service control contract to repair, recalibrate and adjust inoperative or ineffective controls.

e. Convert to modern efficient equipment when aged equipment is found to be inefficient.

f. If possible, insulate above the ceilings of building, as well as heat lines and ducts. This should be done under advice of competent engineers.

g. Consider installing storm windows, doors, outside vestibules, etc. - again upon advice of engineers. Replace broken windows.

h. Switch rows of lighting so all fixtures do not have to be on, unless necessary.

i. Concentrate higher light levels only on tasks where needed.

j. Investigate possible ways to recover wasted heat through such techniques as heat pumps, exhaust heat recovery, etc.

k. Install efficient means to control the intake of outside air, especially in cold temperatures.

l. Seal cracks around exterior doors and windows as well as masonry joints to reduce air infiltration. Plant trees or construct wind barriers against the prevailing winter and storm winds.

m. Repair all apparent leaks and/or breaks in water lines. Install orifice plates in shower heads to reduce hot water consumption.

All of us must weigh energy conservation heavily in our decisions because its importance will increase as time goes by. Rather than consider energy conservation as something strange, it may help to consider it by its old fashioned name: **OPERATING ECONOMY.**

Energy conservation can be achieved in schools without compromise to the learning environment. It can be profitable both in prolonging our sources of energy and in dollars and cents of operating economy.

It will take the combined efforts of all those involved, from planners to engineers to manufacturers to superintendents and school boards to achieve a sensible and worthwhile program. The time to begin these efforts is past - those who have not done so have some catching up to do.

CHAPTER VIII - INSTRUCTIONAL ELEMENTS OF THE SCHOOL

The core of any educational facility is where learning takes place. Learning spaces must be planned and developed on the basic premise of serving the student's learning needs; they must implement the educational specifications formulated earlier in the planning stage and provide enough flexibility to accommodate future changes in methods and procedure. Modern educational research and experience have indicated the desirability of certain changes in the organization of learning spaces. The traditional classroom no longer satisfactorily provides the flexibility and facilities necessary for self-instruction, team teaching, and nongraded programs. School planners have the difficult task of choosing from a wide array of possibilities the types of learning spaces that will best meet the current and future educational needs of their district, while at the same time getting the most usable space for their dollar and minimizing obsolescence. The purpose of this chapter is to provide guidance for school planners in making decisions with regard to learning spaces. A brief description of the components of the learning process, the general implications of different types of activities for learning spaces, and some guidelines for creating separate and different kinds of learning spaces are presented here in an effort to fulfill this purpose.

THE LEARNING PROCESS

In spite of years of extensive research, study, and testing, no one has yet been able to devise a simple formula for the process whereby a person absorbs knowledge. The problem has been approached from several viewpoints - - the environment, the teacher, and the student. The student-oriented approach seems to hold the most promise, since he is actively and individually involved in the learning process. There are three basic components in the student's learning process: "reaction," "interaction," and "action".

Reaction learning is the method that has been traditionally applied in most schools. Here someone (a teacher) or something (resource materials) outside the student is the initiating agent, and the student learns by reacting to this external stimulus. Some question the value of this form of learning; the results seem to indicate it is a rather hit-or-miss method. Simply assigning a group of students to a lecture or class at a prescribed place and time and exposing them to some kind of information will not assure their retention of this information nor their ability to assimilate what they have retained. It is conceivable that reaction learning may in the future be confined to materials that are available when needed by the student, and that the role of the teacher in this aspect of the learning process may undergo considerable change.

Interaction learning involves the exchange of facts, ideas, and opinions with others. It is the type of learning that requires a group setting, where the teacher becomes a fellow participant, acting as a discussion stimulator and resource person without dominating the proceedings. This is a difficult role for the teacher to execute successfully. However, the development and use of seminar-type classes and small discussion groups should be encouraged in order to promote the beneficial effects of interaction learning.

Action learning means the student learns by doing. It is not only independent study, but occurs constantly as the student acquires intellectual, social, and physical skills. The setting may be a music practice room, science laboratory, machine shop, gymnasium, library or the home. A suitable environment is necessary for student-initiated action learning.

These three components of the learning process form the basis for planning instructional spaces. No student will learn equally well by all these processes and school planners must bear in mind the individual needs of those the schools are designed to educate.

GENERAL IMPLICATIONS FOR LEARNING SPACES

The practical application of the learning process outlined above will require that school planners determine the proportional distribution of learning spaces with regard to each part of the process.

Facilities for reaction learning must provide an adequate number of student spaces. Seating should be arranged for proper viewing of the speaker and of projected materials. Light control for projection purposes and for note taking should be prearranged so that the instructor's effort is minimized and continuity is assured in the presentation of material. Provision should be made for audio and visual forms of instruction according to the activity planned for the space.

Interaction learning requires a suitable setting for small groups with a minimum of interference from the outside. Visual and sonic control should be provided to increase concentration within the group. For a small group, the arrangement of space, equipment and furnishings should permit individuals to confront the other participants. Chalkboards and other auxiliary materials should be available.

Action learning requires a wide variety of spaces. For example, a student practicing the violin, a student involved in a physics experiment, a journalism student writing an editorial for the school paper - - each is carrying on a very different and incompatible learning activity which by its very nature requires a different environment. Spaces for action learning require many types of specialized equipment and furnishings (libraries, laboratories, gymnasium, shop areas, etc.); provision must also be made for visual supervision of students in areas where dangerous equipment is in use; unlike other types of learning areas, action learning spaces must observe stricter sanitation requirements - - showers, sinks, locker and storage rooms are necessities in gymnasiums and shop areas.

The basic space requirements for reaction and interaction types of learning are essentially the same, although differences may exist in equipment and furnishings. For instance, a lecture on science will require the same sort of space as a lecture on literature; the same type of arrangement can be used for viewing a film on social studies or on machine shop; the audio requirements are the same for listening to a symphony or a political speech. The same holds true for learning spaces for interaction learning in small group discussions. Thus, specific curricula organization of educational programs is not a significant factor in planning learning spaces for reaction and interaction learning.

Requirements for action learning spaces vary greatly according to the educational philosophy of the school system. In view of the cost of providing and equipping action learning spaces, school planners must be definite on educational goals to be achieved. This consideration applies to the planning of resource centers, laboratories, gymnasiums, etc.; it is especially important in the development of a vocational curriculum, where planners must resolve the crucial question of how to provide for basic needs while preserving a certain measure of flexibility to accommodate future changes.

KINDERGARTEN

Kindergartens are highly desirable and are recommended by the State Board of Education. In view of the current trend toward early childhood education, it is expected that kindergartens will become a requirement in this state.

Kindergarten rooms should provide a minimum of 50 square feet per pupil; more space is recommended to provide increased opportunity for action learning. With a recommended limit of 20 pupils per group, the minimum size room would be 1000 square feet (1200 square feet is preferable).

The room should offer a relaxed, homelike environment to encourage children to live, work, and play together. Furniture and equipment should be child-oriented and child-sized; portable or movable furniture offers the advantage of permitting immediate and spontaneous changes in the learning situation. Flexible arrangements should be made for regrouping the children into small clusters or large groups; individual places should be provided for quiet, personal activities. Versatility and variety in the physical arrangements will maintain the pupil's interest and enthusiasm; it should be possible to alternate "noisy" activities with quiet periods; groups should be able to engage in outdoor activities under supervision while others work indoors.

Shelving in the kindergarten room can be varied - - some movable, some stationary, some recessed. Those units that are movable can be backed with tackboard, providing a very usable combination that can also serve as dividers or partitions within the learning unit. There should be a generous amount of chalkboards and tackboards, and it is important that the units be kept at the child's eye level.

Toilet facilities should be located within the room, with one toilet for each ten pupils. A large sink, with the hot water at tepid level, should be placed near the toilet area.

A drinking fountain, electrically cooled, should be planned within the room. It is very important that the bubbler be at a height convenient for the kindergarten child.

Sufficient electrical outlets will facilitate using audio-visual equipment, cooking experiences, etc.

Properly controlled heating and ventilation, adequate lighting, attractively painted, easily cleaned walls, plenty of storage areas, shelves, cubbyholes are all necessary elements for a suitable learning environment. Carpeting a section of the floor will enhance the homelike atmosphere, and acoustical surfaces on walls and ceiling will minimize noise. Each kindergarten should have an audio-visual area for listening activities, a game center, and individual carrels for independent work.

In general, the kindergarten should be designed with a view to stimulating a child's imagination. Simple, natural materials are preferable to complicated, ostentatious objects. The space as a whole should be challenging, provide freedom of movement for the restless, active child, and also permit the solitary child to pursue his activities uninterrupted.

As many of the play activities will be outdoors, there should be a door leading directly from the kindergarten classroom to the outside.

THE GENERAL ELEMENTARY CLASSROOM

The classroom described here is the so-called "traditional" classroom currently in use in the majority of New Hampshire schools. Classroom size is an important factor in the learning process, whether the type of learning is reaction, interaction, or action. Action learning requires more space than the other two methods, and greater emphasis is being placed on it today.

The minimum size for an elementary classroom shall be 900 square feet. Though usually rectangular, classrooms can be designed in other shapes for the improvement of teaching and learning conditions.

All classrooms should be equipped with adequate storage cabinets for instructional materials, books, and equipment. If no central teachers' room is available for storing personal belongings, clothes, etc., a wardrobe storage cabinet should be provided in the classroom. Other wardrobes can be placed in the classroom if needed, possibly using one side as a bulletin board or chalkboard. Shelving for books and counter space for work areas should be installed for most efficient service. In general, classroom furniture should be selected in accordance with the methods of teaching and learning to take place in the classroom.

The importance of a good visual and sonic environment for the learning process will be discussed in greater detail in a later section (see Chapter XIII). The classroom should be attractively painted and should be well lighted with a combination of artificial and natural light. Window space should be determined in accordance with the educational and architectural specifications. Acoustical ceiling tile and floor carpeting will aid in control of noise. Actual treatment will vary with each room.

With the increasing use of visual aids, several conveniently located electrical outlets are necessary, and means for darkening the room must be provided.

Folding partitions or movable walls may be used between regular classrooms to provide space for large-group instruction. In general, movable equipment and teaching devices (audio-visual, movable demonstration tables, science equipment, etc.) are convenient to use and may be shared by several teachers if sufficient funds are unavailable to provide each with his own equipment and teaching aids.

THE "OPEN CLASSROOM"

Although the open-plan concept is at present applied more frequently in elementary than in secondary school construction, it offers certain advantages at all levels of instruction. In this type of school building, only the exterior walls and those enclosing highly specialized facilities are permanent and load-bearing. With clear span construction the entire floor space becomes one open area, which is then subdivided into smaller teaching areas by nonload-bearing walls. These interior walls may be movable or demountable; they may also be semipermanent, and their removal may involve minor construction work.

In the "open classroom" concept the school is divided into a number of open zones containing no fixed walls or seating arrangements. Learning spaces can be subdivided by cabinets, bookshelves, chalkboards, bulletin boards, and flexible partitions. All these room dividers will have casters or other means for easy movability. By the same token, most furniture and equipment in the open classroom will be movable.

The "open classroom" requires more artificial lighting than the conventional classroom. Since there are few fixed interior partitions, the exterior walls provide the only space where permanent teaching aids such as chalkboards and bulletin boards can be mounted, thus considerably reducing window space. Wall finishes should be selected carefully to cut down glare. Noise control is essential with the large open learning spaces of the open concept. Acoustical ceiling materials and floor carpeting help create proper conditions for learning.

Heat and ventilation control need thorough study, in view of the flexible space and pupil groupings characteristic of the open plan. Designers should also plan sufficient electrical outlets, storage cabinets, student wardrobes, etc.

A well organized and well stocked instructional materials center is the nucleus of the open school. Centrally located, it will contain not only an array of media equipment and materials for group instruction, but also books and other reference materials to be used individually The materials center will provide space for groups assigned to special work, as well as carrels for individual study. The instructional materials center encourages interaction and action types of learning.

Although the open concept requires the rethinking of traditional methods of design and teaching and learning techniques, it offers many advantages for the learning process School planners should consider incorporating some of the features of the open school into their design, possibly in combination with the more traditional methods of construction.

ELEMENTARY SCIENCE

The recommended minimum size for an elementary science learning area is 900 square feet. The same size is recommended for an intermediate science space.

This area should include the following features:

1 Work counter for student use should be placed around the periphery of the learning area, with storage space underneath.

2. Appropriate movable tables throughout; one-third of the area should be left free of furniture to provide for free-space science activities.

3. At least two sinks - - one smaller for water supply and one large clean-up sink per science area, preferably in a service island with storage space beneath. If the island contains electrical outlets, they should be placed to avoid the possibility of shock by contact with faucets or sinks.

4. One large wooden workbench with appropriate tools per science area.

5. Portable heat sources - - electric hot plates or gas cylinders.

6. Spaces for continuing experiments, display of students' exhibits, and or written materials.

7. An electric outlet every six feet of counter space.

8. An area for biology-earth science, including wet and dry work areas.

9. An individual and/or small group instruction area and audio-visual center.

10. If possible, a plant-growing area outside as well as inside the building.

INSTRUCTIONAL SPACES FOR MIDDLE JUNIOR AND SENIOR HIGH SCHOOLS

The increase in the amount and sophistication of knowledge and skills high school students are expected to acquire necessitates marked changes in programs, the kinds and amount of resources available and the way teachers direct the learning activities of students. The learning needs of high school students have changed and continue to change and require a variety of instructional materials.

Instructional spaces need to be changeable and adjustable to provide greater adaptability for a variety of hands-on learning activities. Nearly every subject is taught most effectively when students are actively using the materials from which concepts and knowledge are developed. Thus, the lab approach to teaching and learning is basic to instruction in nearly all subjects.

For general classrooms 900 square feet, including storage, is recommended to provide flexibility and space for individual projects, etc.

The secondary classroom requires proper visual, sonic and thermal environment. As more schools are experimenting with year-round operation, these factors take on greater significance, especially the problem of heating and cooling.

Attractively painted walls with minimum glare, a good balance of artificial and natural lighting, acoustical materials on ceilings and floors for noise control, even heat and proper ventilation throughout the building will provide physical surroundings most conducive to the learning process. Sufficient conveniently located electrical outlets are a necessity. Provisions should be made for television, including closed circuit transmission as well as reception of commercial and educational programs. It is recommended that each room have a permanent screen and darkening provisions for showing film and filmstrips. The type of activity planned for each space will determine the number of storage and filing cabinets required.

The planning and design of secondary schools is becoming more complex, with buildings being used for adult, evening and year-round programs. These innovations place a much greater burden on those writing the specifications for the educational programs to be sure that all groups using the facilities are served satisfactorily.

ENGLISH

1. Furniture should be flexible in order to accommodate groups of various sizes.

2. Teaching stations or carrels should be available for individual work; sections of the room can be arranged to provide for a reference center, reading table, displays, individualized material kits, etc.

3. A small stage or platform for dramatics and public speaking activities might be provided in one or two rooms.

4. Extra chalkboards and bulletin boards are necessary for English rooms.

5. Each room should have a tape recorder, record player, lectern, and unabridged dictionary with stand.

6. Sufficient projectors to serve the needs of the program should be provided, including the 16mm sound, filmstrip with slide attachment, overhead opaque and a video tape recorder on a shared basis.

READING

A Reading Center: Every school should have a well-equipped, attractive area to which students may go for help to become better readers. It should contain the latest equipment, a wide variety of reading materials, and a staff of specially trained reading teachers. The center should be designed to attract both college-bound students and those needing remedial instruction. Remediation loses its stigma when slow readers discover the center is also used by average and superior students. The following guidelines should be used in planning this facility:

1. Larger than usual storage space must be provided; diagnostic services and a program of corrective remedial help demand a great variety of materials.

   a. Intensive phonics material, programmed material, periodicals, newspapers, multilevel instructional kits, and trade books should be available.

   b. The usual audio-visual materials, as well as a controlled reader, tachistoscope and permanent screen should be part of the equipment.

2. Good lighting is most important.

3. Space should be provided for chalkboards and bulletin boards.

4. Aside from filing and storage cabinets, the furniture should include a suitable teacher's desk and desk-chair units or tables for ten to twelve students, with the possibility of arranging the furniture for large groups or routine developmental lessons.

A recent trend has been to locate this center in the library-resource area, where all the necessary materials, equipment, and supplies are readily available. In this case, provision for space and furniture, equipment, and materials should be made for the reading center when planning the library-resource center. The advice of reading specialists will be valuable in determining the specific needs in this field.

SOCIAL STUDIES

Most of the recommendations for the English classroom apply equally to the Social Studies classroom. In order to provide for different learning methods, the room should contain a variety of printed and audio-visual resources. Interaction and action types of learning should be encouraged by the physical arrangements and supported by the materials available.

1. Provision should be made for small group work and discussions, either in separate small rooms or in designated areas within a larger room.

2. Furniture should be movable to allow for a variety of working arrangements (different chair-desk combinations, tables for discussion, etc.) The different specifications will determine the number, size, and shape of tables, chairs, and other furnishings.

MATHEMATICS

Flexible design to permit both large and small group instruction is recommended for the mathematics area. If an experimental approach is used, such as the "lab" type of instruction, tables, instead of desks, might be utilized. At least one larger area of 1200 square feet (instead of the usual 900) should be provided for such a program. If computer instruction is planned, provisions must be made for such a program. It is recommended that schools obtain a copy of "Computer Facilities for Mathematics Instruction" from the Nahovol Council of Teachers of Mathematics, 1906 Association Drive, Reston, Va. 22091.

In a large school, a special work area for mathematics teachers similar to a seminar room could be designed with a math carrel for each teacher, library shelving for reference materials, filing and storage cabinets, etc. In a smaller school, this area could be shared with other departments.

Other requirements for furniture, equipment, and materials are similar to those for English and Social Studies.

FOREIGN LANGUAGES

Classrooms for foreign language study have the same space and equipment requirements as regular classrooms. The extent of the facilities in this area will depend on the number of students and the curriculum to be offered. If several languages are to be taught, it might be advantageous to plan some smaller seminar rooms for small group instruction.

In addition to the classroom, most secondary schools are utilizing language laboratories to offer the student more extensive practice in listening, comprehension, and speaking. Two different basic types of laboratory facilities are available for teaching foreign languages: The philosophy of the department will determine whether only one or a combination is to be used. One type of language laboratory consists of an electronically equipped classroom, where ordinary students' desks have a microphone and earphones, with a taped program supplied from the teacher's console. An advantage of this laboratory is that the classroom can be easily reconverted for conventional methods of instruction by removing and storing the electronic equipment. The fixed laboratory requires a separate room with permanent installations. Students sit in semi-private listening booths which are equipped with earphones; individual tape decks enable them to change their own taped programs. Tape decks may also be located in the teacher control console, which may be either on a raised platform in an exposed desk-cabinet area or in a separate glass-walled room providing visual contact between student and teacher. This type of laboratory should be located between two classrooms and contain a maximum of twenty-five listening stations.

An adjacent work-storage area must be provided for all language laboratories. This area must be soundproofed to permit preparation of tape programs and must have special ventilation due to the heat generated by electronic equipment. By the same token, special provision for ventilation may be necessary throughout the laboratory area. A single switch should turn off all electronic equipment in the laboratory except the overhead lights. In designing the laboratory area, care must be taken to prevent interference with or damage to magnetic tapes and other electronic equipment by fluorescent lamps and other electrical fixtures.

SCIENCE

The development and application of interaction and action types of learning are particularly evident in the field of science. Individuals and small groups are using problem-solving approaches and techniques in laboratory work. There are more student-teacher planned experiments and fewer laboratory-manual experiments. As a result, the requirements for space design and equipment have undergone important changes, with flexibility and the increased use of audio-visual and other aids being stressed.

Since science equipment usually represents an extensive investment, careful consideration must be given to all factors involved to insure maximum flexibility with the most efficient utilization of space.

1. Plumbing and electrical fixtures should be grouped for economy.

2. Special wiring for 220-volt outlets should be planned if needed.

3. Work tables should be located in the most favorable light (southern exposure is recommended for general science and biology labs).

4. Efficient ventilation must be provided for all laboratories. A fume hood over special areas is necessary to supplement the regular ventilation system. It would be wise to install a separate ventilation duct for the storage-preparation area. A separate well-ventilated storage area should be provided for corrosive chemicals as fumes can damage some equipment.

5. A sufficient number of large clean-up sinks should be provided in all science areas.

6. Large, massive lecture-demonstration benches and similar student work areas have limited use and flexibility, and this kind of laboratory furniture is not recommended. Teachers should be provided with a rolling laboratory cart for use in preparing and dispensing materials and equipment.

7. Consideration should be given to developing an outdoor classroom or environmental study site on school grounds.

JUNIOR HIGH SCHOOL SCIENCE AREA

1. Floor space for a laboratory should be 1000 square feet, including adjacent storage and preparation space, per daily 250 minutes of science class occupancy. An elaborate laboratory is **NOT** required.

2. Student stations at counters on three sides of the room.

3. Counters should contain electricity, sinks and gas. (In an open laboratory-classroom these utilities can be provided in service islands.)

4. A sufficient number of two or four-student movable tables.

5. Removable equipment supports in both counters and tables.

6. One chemical hood, stationary or portable.

7. One (or more) large clean-up sink in student space.

8. One 16-foot ceiling beam with open space below for suspension activities.

9. Provision for the following:

   a. Plant and animal growth area.

   b. Rough-handling surfaces for geology.

   c. An aquarium.

   d. A darkroom or equivalent.

   e. A science-reference, study, report-preparation area with audio-visual instruction aids.

BIOLOGY

Recommended area: minimum of 1200 square feet; if special areas, such as plant-growing racks or a greenhouse, are planned, more space will be required. This unit should be designed for efficient housekeeping - - floors, tables, walls and equipment should be water-resistant and easily cleaned. Extra illumination will be needed for such activities as dissection, and auxiliary lighting should be provided in special areas for plant and animal growth.

The following specific features are recommended:

1. Special items of equipment - - refrigerator, pressure cookers, autoclaves, units for cooking and drying, incubators, AC/DC supply units, aquaria and terraria, microscopes - - depending on the type of program to be offered.

2. Space for raising and experimenting with terrestrial and aquatic plants and animals. Special environmental controls, separate from the other parts of the building, are needed for these areas.

3. Adequate sources of water, the use of impervious materials, floor drains and special storage areas will contribute to good housekeeping.

4. Appropriate utilities should be provided either in peripheral counters or in service islands.

5. A sufficient number of two or four-student work tables should be provided.

PHYSICS

1. Recommended area: minimum of 1200 square feet, not including special preparation areas or built-in storage.

2. A sufficient number of two or four-student work tables, at least six feet long (for motion work), with removable supports for class and experiment work should be provided.

3. Counters should be placed on three sides of the room with sinks, gas and electricity, and with storage space beneath them. (In an open classroom or laboratory these utilities can be provided in service islands).

4. Means for completely darkening at least one physics room.

5. Two 16-foot suspension beams, one across front of room and the other down the center with open spaces beneath.

6. Sources of DC current from portable units.

7. Electricity-electronics workbench for student-teacher experiments, equipment building and maintenance.

8. Locked storage for sensitive, specialized equipment, and for radiation sources and toxic chemicals.

9. Possibility of utilizing sunlight by correct location of room.

10. A darkroom for student use.

11. Space for storing long-term experiments and project work.

12. Overhead projector for student use of acetates to present solutions to physics problems, reducing need for extensive blackboard space.

CHEMISTRY

1. Recommended area: minimum of 1200 square feet, not including special preparation and storage spaces. The combined laboratory-classroom may be replaced by a three-room suite with laboratories on either side of a tiered instruction space.

2. Fume hoods: at least one glass-sided hood, 60" x 30", accessible from both sides. If more than one chemistry laboratory is planned, one could be equipped with hoods; if a suite is planned, the instruction space will need one 48" hood.

3. Specialized storage and handling procedures for the following:

    a. Corrosive chemicals.

    b. Toxic chemicals.

    c. Radioisotopes.

    d. Combustible chemicals.

4. Ample storage for glassware and prepared liquid reagents, with separate distribution shelving.

5. Areas should be provided for weighing, for using specialized instruments, for conducting and storage of long-term experiments, and for a reference library.

6. Sources of DC current from portable units for electrochemical work.

7. Easily accessible safety showers and eye washes. If these are to serve more than one laboratory, they should be centrally located.

8. Noncorrosive pipe should be used in all waste lines.

9. Gas, water, and electricity should be provided either in peripheral counters or in service islands.

10. A sufficient number of two or four-student work tables with removable equipment supports should be provided.

SAFETY CONSIDERATIONS FOR SCIENCE AREAS.

Welfare of students and teachers is a first consideration in designing science facilities. This must be basic and superordinate to any other consideration. Factors related to safety specifications include location of science facilities in the building, fume-hood specifications, building codes, floor coverings, use of areas for preparation and student projects, emergency equipment, and special arrangements for handicapped students.

1. Location of science facilities in the building. Some fumes produced in the science laboratories are more dense than the normal atmosphere. When these fumes are produced on an upper floor, they have a tendency to move down stairways to lower levels; therefore, these laboratories (usually associated with chemistry) should be located on the lowest level available.

2. Emergency equipment. Occasionally, small fires may occur in the laboratory and extinguishers should be immediately available. Goggles or similar equipment must be available to protect eyes of persons in certain areas. For example, eye protection and plastic aprons should always be required in chemistry work. Some type of shower and eye bath should also be available.

3. Handicapped students. Special precautions should be taken for the safety of handicapped students. Some service work area should be low enough to allow a student in a wheelchair to work safely. Similar facilities would be needed in a special project area for that student. Whenever possible, ramps as well as stairways should be provided for easy transportation.

ART

Art students need a large lab to work with a wide variety of tools and materials. Thirty square feet of work space per pupil must be provided. Allowing the necessary area for equipment (such as looms and kilns) and for storage and display, sixty square feet per student are required. Built-in counters around the periphery of the rooms extend work storage areas in a practical manner.

The art room should be on the first floor, along the school's main traffic lane and have a large glass area, offering visual stimulation to all who enter the building. An art program with sounds of constructing, carving, wedging, sawing, hammering produces high levels of noise which should not penetrate other areas of study. Noise, dust and fumes must be kept within safety limits with acoustical treatment for wall, floor and ceiling, operable windows and exhaust fans. Floor to ceiling tack surface on all walls furnishes study area as work is displayed. Light colored wall and work surface keep brightness contrast at a desirable minimum. A walk-in storage closet opening off the main room is a necessity.

A diversified art program requires adequate facilities for work and storage of much equipment and numerous supplies. Drawing boards, easels, paints, brushes, papers of various sizes must be readily accessible. It is necessary to have areas for work in jewelry, ceramics, weaving, sculpture by carving, modeling, casting and welding. Block and screen printing also have particular requirements. An area which can be darkened for viewing slides and films is essential.

Educational specifications for the visual arts must provide many and varied opportunities for students to develop their abilities which can lead to personal development and productive careers.

Of prime importance are provisions for safety and ventilation with an exhaust fan and operable windows.

Other provisions:

sinks on island with drainboard,

sturdy rectangular tables with space for four students to work.
comfortable chairs.
easels or sketch benches.
display case.
file cabinets.
chalk board.
wood bench materials, tools.
kiln, wet clay storage, drying shelves.
projectors: opaque, 8mm, slides, overhead.
cabinets for storage of papers, textiles, weaving and student work in progress.
    for storage of brushes, paints, ink, illustrative materials.
    for storage of books, films, slides and other resources.
    for storage of metals, tools and equipment for printing.

MUSIC

A good school music department needs specialized facilities for performing groups - both large and small, vocal and instrumental; classrooms for theory, history, humanities, listening, individualized instruction and school assemblies.

The areas for chorus, orchestra and band must be especially constructed to provide for the unique needs of the program. No other school subject demands such consideration for sound.

The volume of sound varies from individual or group lessons, small ensembles, dance or stage bands, to the 80 to 100 piece band. Yet there is need for quietness in order that the nuance of sound from tapes or recordings may be heard. Other classrooms require sound insulation from music but music must be protected from school and parking lot noises. Even arrangements for climate control must be silent in the music rooms.

For music many tools are required. This necessitates easily accessible storage for instruments, music, folios, records and tapes. Record players, tape recorders, television, radio and piano must be available and sometimes stored. Sufficient space for smooth traffic flow is essential.

Because the size of performing groups will vary from school to school, some rule of basic measurements can be used. National study groups recommend that the height of band rehearsal room be 16 to 18 feet. There should be 25 square feet per person. Thus 2500 square feet of space is minimal for a hundred piece band. Because of the volume of band sound there should be at least 250 cubic feet per person. Yet space for choral activity is sufficient at 125 cubic feet per person.

Sound balance with instrumental groups is attained better from a level floor than risers. Yet voices may blend better with a riser arrangement.

Other concerns: location of music areas in proximity to stage - on same level preferably. A ramp for moving piano on and off stage is desirable. A door directly to the outdoors permits controlled use after school hours, as well as quick access to marching field. The door between music room and other school areas should be double width for instrument moving.

Provision for ventilation should include humidity control to safeguard instrument deterioration.

Four to six practice areas 6' x 8' with splayed walls and glass doors for supervision will serve many students.

Two or more rooms 12' x 12' are desirable for ensemble use. The music library and the music teacher's office may sometimes double for small group practice.

Music rooms require more attention to lighting because much reading is done at greater distance from the reader.

Numerous electrical outlets are essential within the music rooms for effective use of sound systems and projectors. On apron or riser of stage a string of outlets can be used for public address system and lights on music stands.

EDUCATIONAL TELEVISION AND AUDIO-VISUAL EQUIPMENT

When planning new school construction, committees should be cognizant of the role of educational television and the use of audio-visual materials and equipment in the newer teaching methods. New construction of school facilities should be designed with television outlets in each instructional area. The system might be an adjunct of a community cable system or the school may have its own system with a common antenna to service the whole building. There should be sufficient sets available in the school to provide for the estimated needs of the staff as determined by the program. Color sets should be considered in place of black and white reception.

While audio-visual materials and equipment have been available for many years, their use and development has increased tremendously their potential in the learning process. Each room should have sufficient electrical outlets for simultaneous operation of several pieces of equipment and means should be provided to darken the room when necessary.

Modern technology now provides teaching materials and equipment that can be used in all subject areas. The educational specifications must provide guidance to the designer whether each classroom is to be equipped with the necessary outlets, etc., for maximum use of these materials in the individual classroom, or whether there is to be a centralized location for the presentation of such material.

The newer concept of the instructional material center or media center is but one illustration of the advances made in the use of television and audio-visual presentations. This type of equipment can greatly enhance and strengthen the process of learning.

MEDIA CENTER

This section contains guidelines for the library resource center with regard to environment, location, space allotments, and equipment. Schools may wish to go beyond these basic recommendations.

The media center has an integral role in the learning process and is synchronized to the atmosphere and the tone set by other learning areas within the building. It should be functional in design and inviting in appearance. It should have good lighting, acoustical treatment, and temperature and humidity control necessary for the comfort of its users and for the preservation of resources. Floor coverings of sound isolating materials, carpeting in seating and browsing areas, and foam back linoleum in high traffic areas are recommended.

The center should be located to provide maximum access to and from academic programs. Location should also provide exit access to make extended hours and weekend programs feasible. Ramps and elevators should provide total access to resources for all students including the physically handicapped.

Several alternatives exist for resource distribution within buildings of varying sizes. A centrally located media center is normally sufficient for most schools; in media centers requiring a seating capacity of more than 100, heavy duty equipment for classroom and group use should be placed in satellite collections within the disciplines of the curriculum. An alternative is the development of individually viable satellite resource centers organized by disciplines, subjects, grade level or other organizational pattern in line with the school's educational philosophy and existing as branches of the main media center. It should be kept in mind that the multiplication of such satellite centers necessitates additional personnel and necessary duplication of resources.

Whatever alternative the committee adopts, the media center should provide the following activities areas:

1. Individual Study Area. An area for individualized study should be provided, preferably in the form of a small seminar or conference room with sufficient electrical outlets for electronic equipment use. It is suggested that the installation of study carrels, wet (electrified) or dry, be minimized. Experience has shown carrels to be limited in use and flexibility.

2. Small and Large Group Activity Areas. Flexibility of facility and its equipment and furniture is one of the major factors to keep in mind. Seminar rooms may be utilized for small to medium size groups (5-15), but larger groups (25-30) will require larger open areas with furniture adaptable to their needs. Trapezoidal tables with sufficient electrical outlets on external and internal walls as well as around support columns, have provided maximum flexibility and adaptability for varying group size needs. Such trapezoidal tables will also provide space for individual student viewing and listening areas and will retain space flexibility.

3. Circulation and Distribution Area. This area has normally been considered the circulation desk and should more realistically have a distribution counter for light individual study equipment, audio-visual software and circulation control. Media resources return (much like traditional book return bins) should be provided as well as a circulation card control tray area. Audio-visual software shelving should be provided in proximity to this general distribution area. Filmstrips and single-concept loop films should be in open shelving where children may select their resources.

4. Media Production and Preparation Area. An adequate size area easily accessible to both student and faculty and which can be darkened should be provided where duplicating and various other curriculum preparation work can be done. Such areas should have access to water, large rectangular tables, sufficient storage space, flat counter areas, and sufficient electrical outlets for specific equipment required for the following functions:

    a. Photocopying

    b. Dry-mount presswork.

    c. Transparency production.

    d. Motion picture projectors and other viewing and listening devices.

    e. Duplication (Spirit masters, mimeo).

5. Reference Service Area. This function, which utilizes heavy reference volumes, indexing books and periodicals and other resources of the collection, will require large, flat-surface working space. The card catalog, the major index to all media of the school, should also be in this area.

6. Technical Processing and Office Area. The clerical and other support functions of the media center should have appropriate facilities (desks, shelving, and sink for the acquisition and processing of resources), and sufficient space for the administrative work involved in the selection, acquisition, and processing of resources and the general administration of the center.

7. Shelving and Storage Areas. Adequate shelving to store minimum recommended resources. Specialized shelves should be provided for filmstrips, microfilm, 8 and 16 millimeter film and for a minimum of five years storage of back issues of research periodicals at the

secondary level when microfilm is unavailable.

CAREER EDUCATION

Career Education (Career Development Education) has been defined as the total effort of public education and the community aimed at helping all individuals become familiar with the values of a work-oriented society and integrate these values into their personal value systems, and to implement these values into their lives in such a way that work becomes possible, meaningful, and satisfying to each individual.

Career Education, in the opinion of former U. S. Commissioner of Education, S. P. Marland, will eliminate the artificial separation between the academic and the vocational. In other words, the concept necessitates the development of the school's program to integrate all of an individual's educational experience. This total approach is the essence of career education.

For this reason, there is no requirement for special construction requirements to accomplish the goals of career education. There should be ample space in the resource center for materials and literature concerning career education. This space can also be planned for most regular classrooms.

All the instructional spaces within the school should be flexible, adaptable, and, if possible, located to encourage contact with the "world" beyond the school plant, because of the wide influence of the community on career development activities.

PRACTICAL - - INDUSTRIAL ARTS

The Practical-Industrial Arts course offerings fall into three categories: general industrial arts, business, and home economics. These courses, open to all secondary students, provide general background and basic training in the three fields. Vocational education as a preparation for careers in specialized areas is a distinct instructional unit and will be discussed in the next section of this chapter.

INDUSTRIAL ARTS LABORATORY

The function of the general industrial arts laboratory is to provide reasonably adequate facilities in communications, manufacturing, construction, and transportation to enable students to become familiar with each concept area. The general laboratory should be a large area with extensive storage space. It should be on the ground floor or in a separate building with access to service drives, and in a part of the school where the noise of laboratory activities will not interfere with other student activities. At least one overhead door not less than twelve feet wide and high enough for car or truck clearance should be provided.

The following allotments are recommended as guidelines for the space needed for a "heavy laboratory":

Type of Shop	Sq. Ft./Pupil	Sq. Ft. of Open Shop Area
Minimum	100	1800
Adequate	125	2400
Desirable	150	3000

The following criteria for shop design should be observed:

1. Laboratory rooms should be conveniently located for adult or evening classes (not in

a basement area). Adequate natural lighting and a grade entrance for vehicles are very important.

2. The open laboratory areas should be rectangular.

3. The laboratory ceiling should be at least 12 feet high (14 feet is preferable).

4. Partitions should be nonbearing curtain walls containing no mechanical or utility fixtures.

5. Continuous fenestration along the entire outside walls will provide natural light and facilitate future expansion.

6. The laboratory instructor should have headquarters or office space in the open shop area where he will have full view of the working area.

7. Adjustable shelving should be installed in the cabinets and storage areas.

8. Lockers for storage of laboratory clothing (double tier type lockers are recommended) should be conveniently located directly in the laboratory or nearby.

9. The electrical supply system for the laboratory must be carefully designed. Uniform coverage for movable laboratory equipment must be supplied with electrical outlets in most of the laboratory area. One duplex outlet for every 10 feet of wall space should be satisfactory. Equipment must have magnetic starter switches.

10 All power and light controls should be centralized in a locked master control panel near the instructor's office or desk. A master switch should be installed to turn off all equipment simultaneously. Master safety switches should be placed on each wall in a readily accessible area

11. Equipment and work stations should be arranged to prevent interference

12. There should be a safety zone of at least 3 feet between all machines.

13. Unless a separate classroom is set aside for laboratory classes, the laboratory should contain an area for open class discussion, equipped with tablet arm chairs, a ten-foot section of chalkboard, and means of room darkening for projection purposes.

14 The operational level of equipment should be set at the average elbow height of the students.

15 Wall benches 28" wide with heavy wooden tops (1-1/2" - 1-3/4" thick, covered with 10-gauge steel plate are required for automotive, machine, and metal work. Benches for electrical work should be similarly constructed but not covered with steel plate.

16. The hand-washing sink should be large enough to accommodate four or more students at a time and should be equipped with hot water.

17. The drinking fountain should not be a part of the hand-washing sink and must meet State Board of Health requirements., (See Chapter XIII).

18 The welding area must offer special facilities for ventilation and curtain protection.

19. A system for disposal of used flammable material should be provided.

More than in any other part of the school, safety considerations in a laboratory area must be given equal importance with educational objectives Adequate lighting and ventilation, master controls for all machinery, safety zones, and provision for constant supervision of the whole work area are absolute necessities.

BUSINESS EDUCATION

"A program offered to students who wish to develop competency in specific business subjects. The activities may take place in one large room or in separate areas, such as a typing laboratory, a bookkeeping room, a shorthand laboratory, and an office laboratory. Except for those subjects requiring electrically-operated equipment, a regular classroom is acceptable."

The space requirements, furnishings, and equipment will vary according to the scope of the program offered by the school. Specific recommendations will be found in the appropriate section under 'Vocational Education' and may be adapted for the purpose of a specific business subject or a business program. The specific space requirements will be found in Chapter IX ('Standards for Instructional Spaces')."

HOME ECONOMICS

A learning environment for consumer and homemaking or home economics related occupations programs should reflect the needs of the emerging curricula in both these areas.

Home economics education is concerned with the development of the whole individual. For this reason home economics has a triple purpose: first, the preparation of youth and adults for home and family living in a consuming society, second, the preparation of some youth and adults for gainful employment, and third, articulation in the career development concept. Several types of programs may be offered in the elementary, middle or junior high school, high school, and adult levels. In designing home economics learning areas, it is important to plan and equip facilities to attain these objectives.

LEARNING ENVIRONMENTS FOR CONSUMER AND HOMEMAKING EDUCATION

A learning space for studying Family Life, Child Development, Consumer Education and Environmental Housing should consider:

1. Total class and small group discussions.
2. Flexible seating arrangements.
3. Individualized learning centers, stations, or resource area.
4. Storage for resources and audio-visual equipment.
5. Display, chalkboard, and tackboard areas.
6. Project area and storage for skill development, i.e., upholstering, and refinishing furniture.
7. Nursery school for observing and working with small children. May be a community center.
8. Conference area for individual and small group conferences.
9. Teachers work area.
10. Demonstration area to conduct demonstrations related to all subject matter areas.

A lab-type space for learning about foods and nutrition and textiles and clothing should consider the following:

1. Foods and Nutrition Lab

   A. An individual study and reference center for students to work independently at such activities as reading, writing, experimenting, viewing and testing.

   B. An area for individual or small group experimentation in food analysis, testing foods and equipment, time and motion studies, nutritional experiments.

   C. Modified home kitchen units for individual and small groups. No more than 5 units are recommended for supervision with 3 students assigned to a unit.

   D. A serving area where family-sized groups can be served in various ways.

   E. Storage adequate for large equipment, food purchased in quantity and student aprons and books.

   F. An area for demonstrations.

   G. Ventilation to eliminate cooking odors, window screens, garbage disposal, and dishwasher. Washer and dryer available in the department. A complete list of furniture and equipment needs is available from the N. H. State Department of Education.

   H. Lab area should be 1200 square feet or more, including storage.

2. Textiles and Clothing Lab

   A Total class and small group discussion areas.

   B Individualized learning centers, stations or resource areas for working independently at such activities as reading, writing, experimenting, viewing and testing.

   C An area for experimentation by individuals or small groups working on projects involving research and study. Gas, electric lines, special lighting and water should be available in the area.

   D Area for developing skills in selection, care, maintenance and construction of clothing. Area should contain sewing machines (one for every two students), ironing boards and pressing equipment, project storage, dressing area, full length mirror, sink. A complete list of furnishings and equipment is available from the Department of Education.

   E. Lab area should be 1200 square feet - or more, including storage.

VOCATIONAL EDUCATION

Vocational education is recognized as an integral part of public education and planners must include facilities for programs to serve the fifty per cent of students who do not continue their education beyond the twelfth grade. The needs of these students can be better met by providing them with an opportunity not only for the acquisition of academic knowledge in intellectual disciplines, but also for training in job skills that will enable them to perform satisfactorily in their chosen occupation.

This section will provide some guidelines for the main categories of vocational education: Agriculture, Business and Office, Distribution, Health, Occupational Home Economics and Trade and Industrial. If school planners are considering the implementation of a vocational education program, they should use the consulting service of the Vocational-Technical division of the State Department of Education.

SHOP AREAS

Shop areas for vocational education are usually unit shops providing facilities for specialized occupations such as machinists, power mechanics, printing, building construction, agricultural mechanics, etc. The scope of the program to be offered will determine the extent of the spaces required. These spaces should make provision not only for action learning, but also for reaction and interaction learning. General classrooms and areas for small and large group discussions are as necessary in vocational education as in the general academic program. Flexibility and adaptability should be incorporated in the initial design of the shop area, especially since considerable cost and inconvenience may be involved in changing the physical arrangement of the shop spaces to provide for future changes in the program.

In addition to the general requirements for planning any learning area, the shop should include the following:

1. Washing facilities, toilets, and lockers located within the shop area, if possible.
2. Special lighting for such activities as drafting.
3. Reference materials within the shop area in a convenient, easily accessible location.
4. Electric grounding and safety switches for every machine, as well as several master switches in different parts of the shop to shut off power in case of emergency.
5. Vacuum systems and dust collectors.
6. Flooring: Wood floors for woodworking areas.

   Concrete floors for welding shops, auto mechanics and machine shops.

   Resilient tile floors for drafting rooms and electronics laboratories.
7. Storage and auxiliary rooms:
   a. The size and location of the storage area is determined by the type of shop program. In general, each shop should have its own tool and storage space. Extensive storage will be needed especially for lumber, iron and automotive supplies. Provision should be made for easy unloading of bulky supplies.
   b. Special provisions should be made for proper ventilation for spray painting.
   c. A classroom that can be shared with other programs should be located adjacent to the general shop area. If used only for shop instruction, it could be smaller than the general classroom.
   d. Conditions of maximum safety must be provided in all parts of the shop area.
8. Specific programs have specialized requirements such as extra height ceilings in auto shops, dark room in printing shops and exhaust systems in welding shops.

Space requirements for specialized shop areas will be found in Chapter IX ("Standards for Instructional Spaces"). Listed here are the requirements for Vocational Agricultural Facilities, since these will necessitate the provision of areas outside the school building. If this course is to be offered, school planners should take this into consideration in the early planning stages, before proceeding to site selection.

VOCATIONAL AGRICULTURE

The size of the facility will be determined by the extent and choice of the areas of agriculture to be offered. Agriculture includes eight areas: agricultural production, agricultural supplies, agricultural mechanics, agricultural products, ornamental horticulture, agricultural resources, forestry, and environmental occupations. Normally, not all eight of these areas will be included at each school.

Each area will require classroom space.

The shop space will vary with the extent of the program in each area. Agricultural mechanics, forestry, production agriculture, and agricultural resources require 150 - 200 square feet per student; ornamental horticulture, agricultural mechanics, and environmental occupations require 75 - 100 square feet per student. Agricultural supplies and agricultural products do not require a shop area, but need laboratory space of approximately 50 square feet per student.

A Horticulture program has the following special requirements:

1. An all-year greenhouse with a minimum of 1200 square feet of growing area and 700 square feet of head house for soil and plant preparation.
2. One acre of tillable land near the school; a minimum of three acres is recommended.
3. Three acres of land suitable for a permanent plant nursery in close approximation to the school.

A forestry program has the following special requirements:

1. A shop similar to an agricultural mechanics shop with 150 - 200 square feet of space per student.
2. A minimum of 25-acre tract of representative forest land; 75 acres are recommended.

BUSINESS EDUCATION, DISTRIBUTIVE EDUCATION, AND OFFICE EDUCATION

Vocational distributive education prepares a student for a variety of jobs in marketing and distribution such as retailing. Vocational office education prepares a student for a variety of office activities such as typewriting, accounting-computing, communications, reproduction-duplicating, processing of data and words, and miscellaneous clerical work. Business education may be various combinations of the preceding activities.

DISTRIBUTIVE EDUCATION: MARKETING - RETAILING

The laboratory classroom concept applies to this program. The total area should be 1400 square feet (70 square feet per student for 20 students) and rectangular. Provision should be made for the following:

1. A display window area opening into the hall.
2. Portable display units.
3. Model store units.
4. Electrical outlets on each wall and portable lighting units with rheostat control for display purposes.

5. A three-way mirror unit.

6. A work-storage area, including a sink, which provides adequate space for storage of display materials, merchandise, and student materials. Cabinets that can be locked are recommended.

7. All fixtures such as counters, wall-shelving, etc. should be flexible and portable.

8. Enclosed office-conference room in or adjoining the classroom, equipped with desk and chair, filing cabinets, telephone with outside line, conference table, and other general office equipment such as an electronic calculator and typewriter. This location should permit supervision of both classroom and work-storage area.

9. The room should be self-contained, and include a wash basin, audio-visual equipment, and reference materials in current use.

OFFICE (EDUCATION) OCCUPATIONS LABORATORY

This is a laboratory classroom for the required overall course for all office occupation programs. Requirements are as follows:

1. Area of 1200 square feet (60 square feet per student for 20 students).

2. Electrical outlets on each wall, a double electrical outlet for each secretarial desk, and a master switch to control all electrical outlets. Appearance should be that of an office; therefore, all outlets should be either in the wall or in the floor. Tele-Power Poles TM units are acceptable. No cords should be hanging down from the ceiling in the classroom.

3. Candlepower at desk level should be between 50 and 75.

4. Acoustical ceiling and/or walls and sound-absorption floor covering (carpeting).

5. Furniture and equipment: secretarial desks, adjustable secretarial chairs, electric typewriters, electronic calculators, copiers (electrostatic, thermal), duplicators (fluid, stencil, offset), related reprographic equipment such as collators and binders, transcribers, audio tape players, chalkboard or visual aid panel, tackboard, overhead projector, intercommunication telephones.

6. Storage: Work counter with cabinets beneath and a sink near the area to be used for reprographics and/or file cabinets, office machine cabinets, storage lockers or cabinets.

7. Auxiliary space: besides this self-contained room with its audio-visual equipment and resource materials, there should be an area in the room or next to it with a glass partition for a teacher-coordinator-manager's office, capable of serving as "Outsider's area" when using office simulations.

TYPEWRITING LABORATORY

1 Area of 1200 square feet (35 square feet per student for 34 students).

2. Aisle space to each desk.

3. Electrical wall or floor outlets including a master switch that controls all electrical outlets.

4. 50 to 75 candlepower lighting.

5. Furniture and equipment: adjustable typewriting desks and posture chairs, overhead projection equipment, chalkboard and/or visual aid panel, tackboard, individual audio tape players or electronic wireless learning equipment.

6. A work counter with storage cabinets beneath and/or movable storage cabinets. A file cabinet with a drawer for each class section.

7. A sink if students will be involved with duplicating inks or dye and do not have access to a nearby lavoratory.

STENOGRAPHIC LABORATORY COMBINED WITH AN ADVANCED TYPEWRITING LABORATORY

1. Area of 1000 square feet (40 square feet per student for 25 students.)

2. Requirements are the same as for the typewriting laboratory, except that L-shaped desks are recommended, and access to duplicating equipment and electronic calculators should be provided.

3. Typewriter desks must be able to hold at least 18-inch typewriters.

BOOKKEEPING AND SHORTHAND

These two subjects may be taught in a general classroom of 1000 square feet (or 40 square feet per student) if the following requirements are met:

1. Area of 1000 square feet (40 square feet per student for 25 students).

2. Aisle space to each desk.

3. 50 to 75 candlepower lighting.

4. Chalkboard and or visual aid panel, tackboard, overhead projector.

5. Multiple electrical outlets for electronic printing calculators in bookkeeping and audio tape players or electronic wireless learning equipment in shorthand.

6. Work counter with storage space beneath and/or movable storage cabinets including file cabinets with one drawer for each class section.

7 Typewriters in an adjoining room must be available to the shorthand course for transcription during or following the shorthand class.

OCCUPATIONAL HOME ECONOMICS
CHILD CARE AID AND/OR ASSISTANT PROGRAM

Division of Space	Square Feet
Outside play area adjacent to indoor area and on same level - 1/2 paved, 1/2 turf	2,400
Inside nursery school play area, *first floor preferred (35 square feet min-	

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*Not more than 15, 3-to 4-year-old children per group are recommended. A maximum of 16 high school students per section is recommended.

imum per child excluding storage, food preparation and toilet areas)	1,200
Observation room equipped with a shelf and a one-way vision mirror that gives full view of the nursery school	300 - 750
Classroom space, separate from nursery school	600 - 800
Toilet area - Facilities all child size and height, privacy provided, one toilet and one lavatory for each eight children	150
Isolation area	50
Kitchen area	200
Storage and office space (unless part of centralized warehouse and offices)	300 - 450
Total Square Feet - Inside	2,800 - 3,600
Total Square Feet - Outside	2,400

Construction Specifications (Use demountable walls wherever possible.)

Two outside exits must be provided for the nursery school.

Clean, comfortable flooring, carpet on indoor play area except lunch area and arts and crafts center. (Radiant heat would provide a warm floor.)

Inside storage should be provided for outdoor play equipment.

Low lavatory inside entrance from play area.

Built-in storage cabinets closed for teacher supplies, open for toy storage.

Soundproof walls and ceilings.

Voice amplification system to pick up child-teacher conversation within the nursery school. (A tape recorder could be used.)

Lockers or built-in storage space for children's coats, etc. (Near the main entrance.)

Low drinking fountain, inside and outside.

Built-in kitchen unless a kitchen is available near the nursery school.

Adequate lighting.

Tinted glass, blinds or draperies to reduce glare.

Adequate ventilation - screens for windows if the room is not air-conditioned.

Preferred location for the block corner is near the storage for outside equipment so the hollow blocks for both indoor and outdoor play may be stored there.

The area for developing manipulative skills could be placed adjacent to the doll corner. It should be near open shelves and have a table which could also be used as a dining table.

Toilet area should be easily accessible to the outdoor play area.

Personal towel and toilet article hooks or cubicles near bathroom.

Water should be accessible to the art area.

Sturdy tables with adjustable legs and chairs with twelve-inch seat height for three-and four-year olds. (Chairs of different sizes may be selected.)

FOOD SERVICE TRAINING CENTER

Division of Space	Square Feet
Foods laboratory (to provide work stations for 10 to 15 students.)*	1,440
Dining area or faculty dining room (related classroom part-time) to accommodate approximately 40 persons at 14 to 16 square feet per person	600
(Dry) storage of food supplies	200
Student locker room (girls) for approximately 25 students; restroom, shower, and lavatory	300
Student locker room (boys), restroom, shower and lavatory (if boys will be taking the course.)	300
Related classrooms--if enrollment requires more than one section or if it is a two-year program	700
Total Square Feet	3,540

Construction Specifications (Use demountable walls wherever possible.)

This section should be on ground level if possible. If not, it should be readily accessible to receiving entrance, and also elevator provided. An outside entrance to the dining area should be provided if the food service will be open to the public.

Kitchen should be on an outside wall or in a single story area so that exhaust fans can be installed.

The training kitchen should be located near the cafeteria kitchen so that some equipment may be utilized by both.

A dry storage room should have temperature and humidity controls and be equipped with locks.

Storage area for cleaning equipment and supplies must be provided.

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*45 students may enroll in the course, but assignments in the laboratory will need to be rotated with 1/3 of the class working in the laboratory at one time.

CLOTHING SERVICE AND/OR HOME FURNISHINGS SERVICE

Division of Space	Square Feet
Laboratory	1,400
Fitting Room	200
Classroom	800 - 1,000
Walk-in storage and office (unless provided for in centralized area)	450
Total Square Feet	2,850 - 3,050

Construction Specifications

The room should be well lighted.

Built-in storage space should be provided for sewing supplies and garments in construction.

Water should be available.

Ample housepower with adequate, carefully placed electrical outlets.

Space needs to be planned for the storage and use of pressing facilities.

Full-length, three-way plate glass mirror built in or mounted on cabinet doors should be provided.

HEALTH OCCUPATIONS

Classroom and laboratory space shall be determined by the following assessments:

Classroom and lab space shall have a minimum of 1700 square feet for single occupation programs, assuming a maximum student complement of 16 students.

The classroom lab space shall include:

A Lecture-demonstration Area

1 An instructional lecture demonstration area with provision for all teaching equipment (maps, screen and anatomical charts, etc.), student seating arrangement with armchair unit or tables for 16 students.

2 Locker dressing room area.

3 A laboratory area containing basic science lab set-up with gas and running water for 8 students (except in situations where agreement has been reached between the HOE program and the basic science department).

4. Storage areas consisting of counter top and overhead cabinets along all walls except one where there must be provision for floor to ceiling walk-in storage for heavy, awkward and delicate equipment. Counter-top cabinets shall contain two sets of sinks and there shall be provision for scrub sinks (deep sinks with long handles on taps which may be shut off with elbow pressure).

5. A utility private bathroom setup which shall contain:

   a. Utility area of at least three sides, one side "clean" with a set of standard kitchen sinks; one shallow, one medium deep, cupboards, etc. - one side "dirty" containing two very deep sinks, cupboards, etc; the third wall providing space for laundry hampers and bedpan hopper.

   b. Private bathroom area shall contain shower stall, regular bathroom lavatory with mirror and a toilet with side rails and wide door admission for wheel chair.

6. A faculty resource area. Even in situations where a general resource area is nearby, certain HOE resources are sufficiently delicate, expensive and of such public fascination that they might best be retained within the HOE lab. Additionally, because the cluster approach infers much individualized learning, students should be able to coordinate lab practice with stop and go video tape and/or film loop. In this same teaching/learning area, it is recommended that there be a teacher station with shoulder-high privacy and movable file cabinet for locked student records.

7. Portable table-top cabinets which not only provide storage but permit walling off an area to simulate a learning unit (as reception unit, physical therapy unit, etc.)

B. General Classroom

Standard size, separated from the lecture-demonstration room by a folding partition (sound retardant). To be used for pre- and post-clinical seminars and flexible scheduling.

GYMNASIUM

The gymnasium should be a large, well-ventilated, and well-lighted space, whose exact dimensions will be determined by the type of program to be offered. The most frequent activities in the gymnasium are sports - basketball, volleyball, badminton, trampoline - and various conditioning courses for the development of motor skills. Emphasis at the junior and senior high level should be on lifetime activities and will involve even greater space. Although this area should not be designed to serve a single sport such as basketball, planners may find it useful to know the minimum dimensions for a regulation basketball court for different age groups.

Junior High	42' x 74'
Senior High	50' x 84'
Maximum (mainly at college level)	50' x 94'

NUMBER OF TEACHING STATIONS

The number of teaching stations needed for boys and girls should be based on the total pupil enrollment policies pertaining to instructional physical education, the average number of pupils in a class, diversity of program, and the number of periods each week that a station can be scheduled for classes. Computation of the numerical minimum requirement for the secondary level is achieved by the following formula

Minimum	= Number of Students	Number of Periods Class Meets Each Week
Number of	Average Number of	Total Number of Class
Teaching Stations	Students per Instructor	Periods in School Week

The formula for computing the number of teaching stations needed for physical education in an elementary school is as follows:

$$\begin{array}{l} \text{Minimum} \\ \text{Number of} \\ \text{Teaching Stations} \end{array} = \begin{array}{l} \text{Number of Classrooms} \\ \text{of Students} \end{array} + \frac{\begin{array}{l} \text{Number of Physical} \\ \text{Education Periods per} \\ \text{Week per Class} \end{array}}{\begin{array}{l} \text{Total Periods in School} \\ \text{Week} \end{array}}$$

Under the circumstances set forth above, the need is indicated for two teaching stations which will accommodate the 18 daily classes and allow two periods for club activities, special groups, and enrichment experiences.

STANDARDS FOR TEACHING STATIONS

A minimum of 70 square feet per pre-primary student.

A minimum of 100 square feet per primary and intermediate student.

A minimum of 125 square feet per student in the lower, middle, and upper secondary school.

Smaller units for special purposes may be necessary. These should be a minimum of 40 x 60 feet in size and equipped to serve the special needs.

The activity area of the gymnasium should be free of obstructions, pilasters, ventilating ducts, pipes, radiators, water fountains, etc. Folding doors or nets may be installed to divide the gymnasium into smaller teaching areas. Ceiling height requirements vary according to the size of the gymnasium and the planned program activities. It is desirable to have a minimum of twenty-one feet from the floor to the lowest part of the ceiling or joists. The floor should not be slippery, and should have the necessary lines for courts and other game areas marked on it. Extra protection of a heavy wire guard is necessary for windows, lighting fixtures, and thermostats if they are located where they may be damaged by game activities. The level of the lighting is given in Chapter XIII.

Bleacher space for spectators should be provided in accordance with community interest; if interscholastic sports are a part of the program, more seating capacity will be necessary than for a strictly intramural program. The bleachers should at no time encroach upon the floor area used for the learning activities folding bleachers should be considered. At least three to six feet should separate the playing floor and the first row of bleachers or seating.

CORRECTIVE EXERCISE LABORATORIES

Newer concepts in physical education call for "corrective exercise" rooms and other small-group activity spaces. These areas can be used for group games, wrestling, gymnastics, corrective physical therapy, etc. Space for these activities can be provided either in separate rooms or by using dividers in the gymnasium. Separate rooms should be on the same level as the gymnasium to facilitate supervision and administration. the spaces have similar construction requirements as the gymnasium except that the ceilings can be lower. These spaces, especially training rooms, should be equally accessible to both girls and boys.

LOCKER ROOMS AND SHOWERS

These facilities are strongly recommended for elementary schools, especially if the gymnasium is to be made available for community use. Lockers and showers in the physical education area are required for secondary schools and should be readily accessible to both indoor and outdoor activity areas. The rooms should be adequately lighted and well ventilated.

Probably the most satisfactory method for handling clothing in locker rooms is to provide sufficient lockers for street clothing for the largest number of users expected at one time. In addition, one small locker for sports clothing should be provided for each student in the physical education program.

Showers should be near the lockers with a drying area between the shower and locker spaces. A towel room should open into this drying area. For larger installations, shower rooms should have entrances separated from exits. Gang showers are suitable for boys and girls. Private showers for boys and girls should be available to meet individual needs. Mixing valves with automatic water temperature control are recommended.

The floors throughout the area should be covered with nonslip ceramic tile or other impervious material (bare concrete is not recommended for shower rooms). Shower and drying room floors should be sloped so that water will run into floor drains along the walls rather than into a centrally located drain. The walls should be glazed tile or an easily cleaned, nonabrasive surface. The traffic patterns laid out for these spaces should avoid, inasmuch as possible, the mixing of "shoe" and "barefoot" traffic.

Locker rooms should be planned to include water fountains or bubblers and mirrors.

SPECIAL EDUCATION CLASSROOM

The Special Education classroom is desirable for only those students who are unable to function in regular classroom programs with support services and program modification.

Such classrooms should be located on the ground floor in close proximity to an exit equipped with drive-up capabilities, ramps or other ground level entry to make easy access to the area possible. Such rooms should be near ancillary services, provide for all students in the school, and should meet all special requirements related to facilities for pupils to be housed therein.

The recommended size of the Special Education classroom is 900 square feet. The allowable enrollment in any one classroom is not to exceed 15 intellectually handicapped students or ten emotionally disturbed students in any one such class.

It is recommended that facilities for elementary Special Education contain private toilets, a sink and drinking fountain with adequate secure space for storage of specialized materials and equipment required for the program.

The secondary school facilities require such similar space. Special toilet facilities, however, are not necessary if toilet facilities are located elsewhere in the building within easy access of the Special Education classroom.

STUDENT SUPPORT AND RESOURCE FACILITIES

Schools wishing to fully utilize their staff and facilities in appropriately serving handicapped students must carefully plan for appropriate student support services to provide such assistance as necessary to permit students to function in regular programs. Adequate resources must be available to teaching staff to facilitate the development of instructional approaches necessary to meet individual student needs.

In order that appropriate services can be rendered, space must be made available. Student learning centers with special staff materials can supply direct service as needed to students. Facilities must also be available for such activities as tutorial help, speech and language therapy, remedial services, physical therapy, health services, guidance and evaluation testing.

The resource services for teachers may be housed in the instructional materials center, the audio-visual center or in a separate facility. There must, however, be adequate secure storage space for materials and equipment specific to the needs of students with handicapping conditions.

In schools offering vocational programs, special services to deal with problems unique in vocational education should be developed. Capabilities for vocational evaluation should be provided as part of the testing and evaluation capability of the program.

Space should be provided for services of such New Hampshire Department of Education, Division of Vocational Rehabilitation personnel as may be requested and assigned to provide vocational rehabilitation services within the school.

CHAPTER IX

STANDARDS FOR INSTRUCTIONAL SPACE

Instructional spaces and/or classroom size are calculated on the basis of the educational specifications (see Chapter IV of this Guide) determined early in the planning phase of the building program.

To obtain approval of the plans and specifications of the project by the New Hampshire State Board of Education as required by RSA 198:15c, the applicant district shall provide sufficient data and other pertinent information to show that the educational specifications will be met. The Castaldi Nomogram is a reliable method for determining the number of teaching stations needed in the facility.

EXCEPT WHERE CONSTRUCTION CALLS FOR FIXED OR PERMANENT INTERIOR PARTITIONS, APPROVAL OF THE SIZE OF CLASSROOMS OR INSTRUCTIONAL SPACES WILL BE DETERMINED BY AN ACCEPTABLE NUMBER OF SQUARE FEET PER STUDENT MULTIPLIED BY THE TOTAL PROJECTED NUMBER OF THE CLASS OR GROUP. It is, however, strongly recommended that school planners make provision for more space than the "acceptable" minimum required. In order to provide flexibility and to facilitate the accommodation of increased pupil enrollment and program growth, a recommended number of square feet per student is also given. It is hoped that committees will give serious consideration to this suggestion.

STANDARDS FOR APPROVAL OF INSTRUCTIONAL SPACES
ELEMENTARY SCHOOLS (K-6)

RESOURCE CENTERS OR LIBRARIES	**SPACE REQUIREMENTS**
Schools with less than 150 pupil enrollment	Space may be provided in regular classrooms
Schools with 150 - 300 pupil enrollment	1,000 sq. ft. or one regular classroom
Schools with 300 - 500 pupil enrollment	2,000 sq. ft. or two regular classrooms
Schools with an enrollment of more than 500 pupils	Minimum area to equal 10 per cent of enrollment times 40 sq. ft. per pupil

CLASSROOMS

A REGULAR CLASSROOM, WITH FIXED PARTITIONS, SHALL PROVIDE A MINIMUM OF 900 SQ. FT., INCLUDING STORAGE, OR 30 SQ. FT. PER CHILD, WHICHEVER IS GREATER. A KINDERGARTEN CLASSROOM SHALL PROVIDE AT LEAST 1,000 SQ. FT., INCLUDING STORAGE OR 50 SQ. FT. PER CHILD, WHICHEVER IS GREATER.

It is recommended that 40 sq. ft. be provided per pupil in regular elementary classrooms and 60 sq. ft. per child in kindergarten rooms.

"OPEN CLASSROOM" SPACE SHALL PROVIDE A MINIMUM OF 40 SQUARE FEET PER STUDENT FOR INSTRUCTIONAL SPACE. This shall be determined by deducting the square feet necessary to meet the requirements for the instructional materials center, and area for specialized rooms, the administrative and service spaces, from the gross square feet in the building; the remainder is divided by the planned capacity of the building.

Committees may wish to consider additional space for greater ease of pupil circulation within the building.

CONFERENCES BETWEEN THE APPLICANT DISTRICT AND CONSULTANTS IN THE DEPARTMENT OF EDUCATION SHALL TAKE PLACE BEFORE FINAL APPROVAL OF PLANS. The size and number of spaces other than resource centers and classrooms will be approved in accordance with the educational specifications; this will include conference, seminar, and small-group instruction rooms. All designs and drawings must specify each instructional space, such as general classrooms, laboratories, seminar rooms, special instructional areas, etc.

MIDDLE/JUNIOR HIGH SCHOOLS

In planning or developing educational facilities for Middle/Junior High School students, major emphasis should be placed on providing flexibility of spaces. The characteristics of early adolescents require that most subjects be taught through a lab approach with considerable hands-on involvement with materials and processes; also, these students find it difficult to sit for long without investigating how things are put together, how they work and the uses they can be put to.

The instructional program should provide a balanced program with a strong emphasis on the fundamentals and extensive exploratory experiences for both boys and girls in Art, Home Economics, Industrial Arts, Music, forensic activities and Health and Physical Education.

If traditional instructional spaces are designed, classrooms should be at least 900 square feet.

SECONDARY SCHOOLS (GR. 7-12)

A REGULAR CLASSROOM, WITH FIXED PARTITIONS, SHALL CONTAIN A MINIMUM OF 800 SQUARE FEET, INCLUDING STORAGE, OR 30 SQUARE FEET PER STUDENT, WHICHEVER IS GREATER.

Subject	Square Feet Per Student	
	Acceptable	Recommended
Regular Classrooms (English, Math, Language)	30	35
Social Studies	35	40
Language Lab	35	40
Science - Combination Lab-Classroom	60	70
Single-Purpose-Room Lab	50	60
Art	60	70
Industrial Arts - Junior High	75	100
Senior High	100	125
Home Economics - Food or Clothing Laboratory	50	60
All-Purpose Department	60	70
Music - Instrumental	35	40
Choral	10	15
Practice Rooms and Storage as required		

Library-Resource Center: 10 percent of enrollment at 40 square feet per student.
Minimum area approved: 1,800 sq. ft. (See Chapter VII).

	Acceptable	Recommended
Physical Education		
Junior High School	100	125
Senior High School	125	150
Vocational Offerings		
Agriculture - General Shop	130	150
Horticulture Shop	75	100
Greenhouse	100	120
Business and Office Occupations		
Bookkeeping, Shorthand	35	40
Beginning Typing Laboratory	35	40
Office Procedure Laboratory-Classroom	50	60
Stenography, Advanced Typing Labs	40	50
Basic Business: Economics, General Law, Management	35	40
Distributive Education		
Combination Lab-Classroom	60	70
Health Occupations	60	70
Occupational Home Economics		
Food Service, Lab-Dining Area and Storage	110	120
Child Care Services	110	120

	Acceptable	Recommended	Minimum Acceptable Lab
Trade and Industrial Education			
Auto Mechanics	175	200	2,600
Machine Shop	150	175	3,000
Building Construction	125	150	2,400
Drafting	60	80	1,500
Electricity-Electronics	60	80	1,600
Printing-Graphic Arts	100	125	2,100
Welding	60	80	1,800
Culinary Arts, Cooking	100	125	1,800
Building Service Mechanic	60	80	1,600
Plumbing, Heating, Sheet Metal	80	125	2,100

It is recommended that classrooms and related laboratory facilities be located adjacent to each other or in close proximity, and that additional storage space be provided. These recommendations are made for any vocational program, whether or not Federal funds are to be applied for.

CONFERENCES BETWEEN THE APPLICANT DISTRICT AND CONSULTANTS IN THE DIVISION OF VOCATIONAL-TECHNICAL EDUCATION ARE TO BE HELD EARLY IN THE PLANNING STAGE. The consultants will assist the committee on the basic facilities and items of equipment necessary for a vocational program. They will also suggest ways to strengthen the vocational program by including a combination of vocational offerings specially suited to the needs of the district, including multipurpose rooms and storage facilities, etc.

GENERAL

Space requirements for gymnasiums, and all-purpose rooms, described in Chapter VIII, "Instructional Elements of the School." Requirements for cafeterias, kitchens, health services, administration, and general pupil services are found in Chapter X. "Auxiliary Spaces."

CHAPTER X

AUXILIARY SPACES

Auxiliary spaces in schools serve in a supportive capacity to the instructional program and serve to accommodate the nonclassroom needs of students and staff. Although such auxiliary spaces as hallways, rest rooms, and storage facilities are found in older schools, increased use of this space for the support of instruction has been fairly recent. New trends in teaching methods, new and varied concepts in school design, new media for disseminating information, and a new attitude towards the school's function as a community center have all contributed to this development. These factors will assume more importance in future years, and auxiliary spaces must be designed as an integral part of the total education program.

Auxiliary spaces must be carefully planned, taking into consideration such factors as increased enrollments, future changes in the educational program and different methods of instruction. Classrooms can be added to a building without too much difficulty, but auxiliary spaces can seldom be expanded at reasonable expense after initial construction. Overcrowded auxiliary facilities are usually inefficient and may negate much of the effectiveness of instructional areas.

School planners should be aware of the possibility of multipurpose uses of auxiliary spaces. An initial step in this direction is an analysis of the basic function of each auxiliary space required to fulfill the educational specification. In general, spaces such as private offices, custodial quarters, kitchens, and rooms for mechanical plant equipment and operation do not lend themselves readily to multipurpose use, unless they can be used for classes relating to their specific functions, as, for instance, use of the kitchen for a food service program. Such spaces as the lunchroom, the gymnasium, and the auditorium may be combined in several ways. For example, the cafetorium can serve as a lunchroom and auditorium; the gymtorium can serve as gymnasium and auditorium; the same area can serve all three of the above functions; and the auditorium can be combined with a theater. Dual use of these areas requires careful planning and usually places some restrictions on their adequacy for a specific purpose.

Once the basic function of each auxiliary space has been determined, planners should consult the architect in order to integrate these spaces into the total project. Some of the anticipated questions are whether certain spaces, if enlarged, would do the work of two, but in less area; whether greater flexibility for changes could be achieved by a combination of two or more areas; whether savings could be realized in the costs of construction and operation; whether the disadvantages of converting from one use to another in the same space would offset the possible savings. Multi-use auxiliary spaces should never be planned as a compromise to save money or to fit a building on a limited site; such compromises may even reduce the usability of the space so that it will not serve any of the planned purposes satisfactorily and thus be money poorly spent.

The following sections of this chapter are suggestions and recommendations that should be helpful in planning for such auxiliary spaces for administration, guidance, the faculty area, auditoriums, school lunch and health services.

ADMINISTRATIVE

School planners too often restrict the space for the administrative suite. This facility should be centrally located where it will be easily accessible to the public. While the office need not be elaborate, its general appearance should impress the visitor that it is the school headquarters. Ideally, the main office should be divided into at least two areas, one of which should be a soundproof inner office for the principal. The principal's office should be large enough for conferences with teachers, students, or other groups. The outer office should provide adequate space for the clerical personnel and equipment. In a larger school a separate office should be provided for the assistant principals and the secretary to the principal.

The administrative suite should also include the following:

1. Adequate filing and storage facilities.
2. An intercommunication system within the school.
3. Durable, comfortable, attractive furniture.
4. Good lighting for all areas.
5. Controlled heat and ventilation for year-round operation. Air conditioning should be considered.
6. Provisions for safeguarding funds, records, etc.
7. Ample electrical outlets for office equipment.

GUIDANCE

To encourage greater student use, this space should be located near the library or instructional materials center. The facility should be designed along the following lines:

1. One counselor's office for every 500 pupils or portion thereof (of maximum enrollment).
2. Each counselor's office should be at least 8' x 12.5', for a minimum of 100 square feet.
3. One waiting room containing a receptionist-secretary area, work tables, shelving for books and bulletins, and filing cabinets.
4. One conference room large enough to seat twelve people comfortably.
5. Storage space for testing materials, etc.

AUXILIARY FACULTY FACILITIES

Two types of facilities for teachers' out-of-classroom use should be included in the school: preparation-conference spaces and dining-lounge area, either separately or in combination.

In the past teachers were provided little space for the preparation of instructional materials other than their desks in the classroom. If, however, creative teaching, with a variety of materials and methods is to be an objective of the instructional program, teachers need space for planning and developing instructional materials for various student levels in their classes. Much of this will be for teacher and pupil use in media projection and self-directed study. Ideally, the library-media staff will be trained and equipped to develop these materials for, and in cooperation with, the staff. This should be a major consideration for locating the staff work area either adjacent to, or as a part of, the library media center. Additionally, this will increase use of media equipment by the staff.

There should be a faculty lounge for refreshment breaks and relaxation, and a separate dining area for staff members. Such spaces will be good areas for staff planning and communication.

SCHOOL HEALTH FACILITIES

Proper and complete physical facilities are a necessity for effective health services. A qualified school nurse should be consulted when planning the health suite. This space should be located near the guidance office and the administrative office, as close to the main entrance of the school as possible, and easily accessible to students, parents, and school personnel. Space requirements vary according to the enrollment, available staffing, and the scope of the total school health program. In general, a minimum of 625 square feet of space is recommended for a school of 750 - 1000 students; schools with lower enrollment can modify the arrangements of the health suite according to school and community needs.

The health area should provide the following facilities:

1. Reception and waiting area (may be combined with guidance and/or administration.)
2. Office and record storage for the school nurse (clerical staff, telephone, intercom system are recommended in addition to regular office materials.)
3. Resource library with materials for health instruction ("health alcove" in school library including audio-visual materials.)
4. Comfortable rest rooms for temporary care of students and/or personnel.
5. Conference room for consultation and health counseling.
6. Examination room and equipment for hearing and visual screening, dental health inspection.
7. Space for scientific, health education displays.
8. Toilet facilities and extra lavatory for frequent hand washing.
9. Storage for first aid supplies, etc.

AUDITORIUMS

The auditorium and/or theater may serve several functions. It may be used for community programs and public meetings, school assemblies and large group instructional activities. If it is divisible into smaller units, it can function as a lecture-demonstration area and/or a large-small group instructional facility. The auditorium can provide excellent facilities for the school's performing groups in music, drama, public speaking, etc.

There are few single-purpose auditoriums in New Hampshire due mainly to the expense involved and limited utilization. However, the auditorium can be used for instructional purposes, which makes construction of this facility more feasible. Except when the auditorium is being used for an assembly or similar type meeting, it can function continually as an instructional area. If the auditorium can be utilized for both small and large group instruction during the school day by the use of folding walls or other dividers, planners may find economic justification for constructing this space, since it may be possible to eliminate similar type-of-teaching space in other parts of the building.

It is strongly suggested that professional help be obtained in planning the auditorium, particularly if it is to be used extensively for performing groups. The lighting (stage and auditorium), the acoustical treatment, the seating, as well as other features must be planned and designed very carefully to provide an effective facility.

SCHOOL LUNCH FACILITIES

A school lunch program requires two major kinds of space: one for preparation (including receiving, storage, preparation and cleanup areas) and one for dining. A participation of 75 percent of the elementary students, 60 percent of the high school students, and 30 - 50 percent of faculty and staff may be projected for a well managed program.

Preparation and storage facilities should be located at ground level, adjacent to the dining area, with a separate entrance. The following space requirements apply to the kitchen and dining areas:

RECEIVING: Outside loading - Unloading dock at same level as receiving and storage areas - desirable to be covered by a roof.
Inside receiving - Could be considered in a large kitchen.

MAINTENANCE: Trash and Garbage area should be 30 - 50 sq. ft. with floor drain and hot water for washing cans.
Mop room - a room or area about 10 sq. ft. for a mop sink with both hot and cold water if space is available. Otherwise this sink should be located in a separate refuse room. Adequate ventilation for drying mops is essential.

STORAGE: Dry Food Storage - 1/2 cu. ft. per meal load. This is a maximum figure. Could be reduced if considerable frozen food is used.
Refrigerated Storage - Approximately 1/4 - 1/3 cu. ft. per meal served. It is not practical to buy a refrigerator smaller than 60 cu. ft., which occupies approximately 6' x 30'' floor space. One section of the refrigerator with pan files is recommended. When more than 66 cu. ft. of refrigerated space is needed, consideration should be given to a walk in.
Frozen Storage - An 8 x 10 x 12 ft. area is recommended. If this is not feasible, 26 cu. ft. of freezer space should be provided. If a walk in is selected it should be at floor level.
Milk Storage - Necessary in addition to other refrigeration - preferably in the serving line.

NOTE: The floor of all storage areas - dry, walk-in refrigerator and freezer, should be flush with the floor outside to permit the easy movement of portable equipment.

FOOD PREPARATION: on site - A rectangular kitchen provides more efficient use of space. The amount of space needed is determined by the number of meals to be prepared.

a. Allow 2½ sq. ft. per meal if kitchen is planned for 200 meals.

b. Allow 1½ sq. ft. per meal for 350 - 750 meals.

c. Allow 1 sq. ft. per meal for 750 plus, meals.

SERVING: Space needed is determined by the number of serving lines, which in turn are determined by the number of students, length of lunch period and the schedule for releasing students. It is recommended that 1 sq. ft. of serving space be planned for the estimated number of meals to be served.
The space needed for a **SATELLITE LUNCH PROGRAM** is determined by the type of service planned. If it is a Bulk Service type, plan for same space as one needs for on-site prepared service. Additional 220 volt electrical service for mobile serving line and carrier heaters is recommended along with a one compartment s/s sink for cleanup. For a preplated type system, an area 6 ft. by 3 ft. is needed, plus space for a milk cooler. Trash compactors are usually needed for these sites. If food is to be held for long periods of time, 220 v. electrical service should be provided for self-contained hot food carriers.

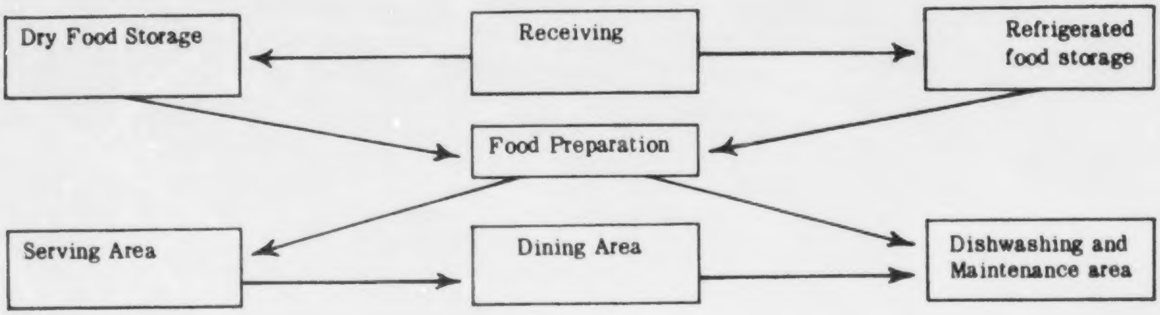
DINING:	Area needed depends on the number to be seated at one time. Usually should be planned for 1/3 daily participation, which means that each chair would be used three times. An average of 10 - 12 ft. per seated person at one time is recommended.
DISHWASHING:	180 sq. ft. minimum from 250 - 750 meals - 180 to 250 sq. ft. from 750 meals up.
OFFICE SPACE:	Every lunchroom where meal preparation is in process should have a separate office for the program manager with space for a desk, chair, and file.
RESTROOM:	A locker and toilet area of 30 - 50 sq. ft.

NOTE: The above recommended space allowances will permit adequate aisles. These should be a minimum of 42 - 60'' where workers and carts have to pass. Between oven equipment and work tables, 3½ ft. traffic aisles, 3 to 4 feet. Between the front of a refrigerator and other equipment and work tables, 3'. Between two work tables, 3½ to 4½ feet is desirable.

GENERAL CONSTRUCTION FEATURES

WALLS:	Smooth, impervious to moisture, easy to wash and keep in repair, vermin proof, metal corner guards, and light colors.
CEILING:	Smooth, impervious to moisture, easy to clean, rodent proof, and fire resistant.
FLOORS:	Nonresilient such as ceramic, terrazzo, or quarry tile, also slip resistant, treated concrete with recessed floor drains. Curbs or gutters should surround areas under steamers, kettles and can washing equipment.
DOORS AND WINDOWS:	Outside doors: Self-closing devices and locks. Inside doors: Lock and sound absorbing effect. Metal door frames. Walk-in refrigerators and freezers must have locking devices that can be opened from inside. Screens: Plan screens for all doors and windows Windows: They should be high enough not to obstruct equipment placement and located for cross ventilation. Louvers, rather than windows, are recommended for storage areas.
LIGHTING, TEMP.: CONTROL, AND VENTILATION:	Separate ventilation system from the rest of the school. Provide for the free circulation of air at the worker's level in all work areas. Dry storage areas should have outside ventilation, with no sunlight. Separate temperature control for the kitchen area is desirable. Special wiring and outlets for heavy equipment and spare circuits for additional equipment.
KITCHEN LAYOUT:	Plan the facility arrangement for efficiency of operation with emphasis on principles of motion and labor economy. General work areas should be arranged to allow overall flow of work in a straight line; the flow

of material being processed should be continuous or direct in progress. The following diagram illustrates the interrelationships of areas within the school lunch facility.



Detailed guidelines for facilities and equipment are available upon request from the Department of Education, Food and Nutrition Service. If school lunch facilities are being planned in a building program, the Food and Nutrition Service Consultants prefer to evaluate the facility design from the conceptual drawings and to make comments thereon prior to the finalization of the working drawings.

SUPPORT FACILITIES

Sufficient storage capacity must be planned for the new building. This is true both for instructional and noninstructional areas. Storage in classrooms is extremely critical where the so-called "hands-on" type of instruction takes place. Careful planning is necessary for centralized storage areas for instructional materials, and committees might consider the "high-density" type unit to achieve maximum use for limited areas. Planners must consider the long-range demands on storage facilities because too often buildings prove to have inadequate storage space after a few years' use.

As outlined in Chapter VIII different subjects require different types of storage facilities. Because of its importance, however, it should be reiterated that science laboratories have a storage room or cabinet of fire-resistant or fireproof construction that can be locked. This will provide safe storage of dangerous chemicals, acids, etc. Other types of classroom activities may also require such specialized storage capability.

The custodial staff must have convenient and adequate storage space. Consideration should be given for satellite storage/work areas on each floor, and if the building is large a maintenance room should be included in the plans. A special room or facility should be planned for the storage of flammable materials, such as waxes, paint, etc. This room should also have suitable extinguishers and detectors.

When planning the location of all storage areas, the committee should keep in mind the service and delivery entrance. Supplies and materials delivered to the building should not have to be carried too far inside and should be moved so they do not interfere with student traffic. Outside the building the service and delivery entrance should be independent of normal student and faculty traffic.

An important consideration in planning today's schools is the method to be used for disposal of waste - will there be an incinerator within the building or will the refuse be picked up for off-site disposal? It might be practical to correlate this activity with the general practice within the community. Local regulations will probably govern the proper disposal of waste.

Schools with an athletic program and physical education curriculum will also have to plan for exterior storage of equipment and machines. Many schools find it convenient to have a separate building on the athletic field for storage of instructional equipment as well as mowers and other machines. Convenient location of such storage facilities can often reduce the time and effort of instructors and groundskeepers in organizing and carrying out their assignments.

CHAPTER XI - FURNITURE AND EQUIPMENT

Selection of furniture and equipment for classrooms, laboratories, resource centers, gymnasiums, offices, etc., should be part of the initial planning phase. Flexibility and adaptability are major factors to be considered. Movable equipment is recommended wherever practical in order to make instructional aids available to as many students as possible, and to facilitate independent study. A comfortable environment is essential to the learning process, and furniture and equipment should be adjustable in size and height to the age group or to individuals for whom they are intended.

Units should be selected not only to serve immediate needs, but with a view to fulfilling future requirements. Many items today provide movability and multipurpose usability. School planners should ascertain that all furniture and equipment serves the educational specifications that have been adopted.

For convenience, the equipment schedule should be in two major groupings: equipment (fixed items) and furniture (movable items). Items within the two groups can then be divided into specific categories (shop, library, etc.) Both unit prices and a total bid price for a particular grouping should be requested when purchasing equipment.

It is suggested that fixed equipment within the building be kept at a minimum. This will make future changes in the building easier and will make the facility more flexible if educational requirements are modified later.

EQUIPMENT CONSULTANT

If the building project is extensive and will require considerable outlay for equipment, consideration might be given to engaging a consultant with expertise in the area. Such a professional can offer a service that will assure the purchase of the proper equipment for the project. He can also aid in the writing of specifications for bidding and can follow progress of the project to assure arrival and installation of equipment at the proper times.

Many of the larger architectural firms have equipment consultants who provide this service, and committees can decide the circumstances under which to employ such an individual.

The architect must work closely with the equipment consultant for good coordination in the purchase and installation of equipment. For this reason, he should be acceptable to the architect even though he might be employed by the district.

A method gaining favor is the submittal of bids for furniture direct to the client or equipment consultant. This method assures that the educational specifications will be followed; it also provides for professional coordination of the mechanical, electrical, and construction design, as well as aesthetic considerations of color, finish, and design that will complement the structure.

If bids for furnishings are solicited separately, the following procedure is recommended:

Advertise:	Inform as many suppliers and manufacturers as possible.
Bidding Documents:	Prepare concise drawings and specifications. Allow a minimum of two weeks for quotations.
Bid Openings:	Establish time and place to open and read bids.
Bid Evaluations:	See that proposals comply with specifications. Check bid security and delivery dates. Check any alternative proposals.

Furnishings Review:	If there are enough reasons to warrant, ask all qualified bidders to present samples, catalogs, and to meet to answer questions.
Contract Award:	The contract should be awarded to the lowest bidder who meets or exceeds the specifications. A company that bids as specified should be given prime consideration. Other bidders who propose alternative furnishings should be given careful item-by-item consideration.

INSTALLATION

The installation of furniture and equipment requires thorough attention and supervision by all concerned. It is recommended that a check list be used and that the architect be consulted in the final evaluation of installation.

The Department has had many inquiries regarding expenditures for equipment on school projects. It is difficult to indicate a definite amount as to how much equipment would be required for specific projects. This should be determined by the program and the educational specifications.

However, in order to provide some guidance to local committees as to the proportionate cost for equipment to the total project and/or construction costs, a survey was made of 13 high school and 9 elementary projects. These schools were built over the past six years and it was found that approximately 14.5 percent of the project cost was expended for movable equipment for high schools and 12.0 percent for elementary schools.

The proportion of equipment cost to the construction cost was 20.1 percent for high schools and 15.7 percent for elementary schools.

CHAPTER XII - FIRE SAFETY REQUIREMENTS *

Greater emphasis on life safety has resulted in stricter laws and regulations which will have great influence on construction, especially on structures built for public use. Though laws and regulations are generally minimal in concept, they should be exceeded whenever possible where safety must be considered.

The 1973 session of the New Hampshire General Court passed a bill to provide for a uniform fire and safety code applicable to all towns and village districts of the state to provide construction standards for public buildings. As this statute is so important regarding new school construction, two sections of the statute RSA 155-A:1 are presented for the benefit of the readers:

11:1 By-Laws. Town and village districts may make by-laws requiring factories, hotels, tenement houses, public buildings, school houses, places of assembly as defined in RSA 11:17, I, and other buildings used as places of public resort in their towns, to be so erected as not to endanger the health and safety of persons who may occupy them; however, and by-law relative to safety from fire in buildings and structures adopted by a town or village district of the state shall conform to the life safety code, which is in effect at the time the by-law is adopted and as promulgated by the state fire marshal; such by-law may provide for local inspections and enforcement and shall include assistance of the state fire marshal where required.

155-A:1 Construction Standards: All new buildings constructed by the state or any of its agencies, and all new schools, halls, theaters or other public buildings in this state in which more than one hundred people can be assembled shall conform to standards not lower than those established by the "National Building Code", 1967 Edition, and amendments thereto duly adopted, except the standards, including definitions, not lower than those established by the "Life Safety Code," NFPA Doc. No. 101, 1970 Edition, and amendments thereto duly adopted, shall take precedence over all provisions of the "National Safety Code" respecting means of egress. Amendments to said codes shall take effect only after being adopted in accordance with the procedures for promulgating rules and regulations by the state fire marshal as set forth in RSA 153:5.

The following codes, which are enforced by the State Fire Marshal, should be available to those responsible for planning and designing buildings. For that reason, they are listed by title with the address where they can be obtained:

"National Building Code"
AMERICAN INSURANCE ASSOCIATION
85 JOHN STREET
NEW YORK, NEW YORK

"Life Safety Code", 1973 Edition

"Storage and Handling of Flammable Liquids, Gases, Liquid Petroleum Gases"
Codes #30, #54 and #58

"Installation of Oil Burners and Equipment"
Code #31
NATIONAL FIRE PROTECTION ASSOCIATION
60 BATTERY MARCH STREET
BOSTON, MA.

It should be noted that while the new statute repealed several previous laws regarding construction standards, RSA 155:8-a, pertaining to making buildings accessible to the physically handicapped was not repealed. Please refer to Chapter II regarding this very important statute, which contains very stringent design implications.

STANDARDS FOR FIRE SAFETY IN SCHOOL BUILDINGS

All plans and specifications for new school construction must be approved by the State Fire Marshal before plans are put out for bid.

Before building aid is approved by the State Board of Education, a certificate of approval of the plans and specifications must have been received from the Fire Marshal.

In addition to state laws and regulations, local building codes and regulations should be reviewed prior to the design phase of the project. Often local codes are more rigid than state laws and regulations.

THE DRAWINGS AND SPECIFICATIONS OF PUBLIC SCHOOL CONSTRUCTION ARE EVALUATED BY THE FIRE MARSHAL ACCORDING TO THE LIFE SAFETY CODE, CHAPTER 8, WHICH PERTAINS TO EDUCATIONAL OCCUPANCIES, AND CHAPTER 17, OPERATING FEATURES. IN ADDITION, THE FIRE MARSHAL WILL JUDGE THE DRAWINGS AND SPECIFICATIONS ACCORDING TO OTHER RELATED PARTS AND STANDARDS OF THE LIFE SAFETY CODE.

FIRE EXTINGUISHERS

Suitably approved fire extinguishers must be provided for the shops, kitchen, laboratory, heater rooms, and fuel storage areas. Fire extinguishers should be models approved by the Underwriters Laboratories and be readily available in special cabinets or on wall racks. An extinguisher should be located near each school alarm-sounding station.

Different types of extinguishers should be in different locations, according to the particular kind of fire most likely to occur in the area. The following information should be helpful in selecting and placing the equipment:

Type of Extinguisher	Location in Building	Use
Pressurized Water	General use throughout building.	Not for use on electrical and flammable liquid fires.
Carbon Dioxide Dry Chemical	Locate near flammable liquid storage, electrical, panels, and science equipment.	Liquid and electrical fires. Not effective for deep-burning fires.

FIRE ALARM SYSTEM

Every school building of more than two regular classrooms shall be equipped with a suitable fire alarm system. Electrical systems shall be provided in all schools of more than one story or more than eight classrooms. Such systems shall be those known as closed circuit, supervised, and with break glass stations. There shall be an alarm-sounding station in the boiler room, and at least one in each corridor, with additional stations located as required by conditions in the building. The alarm-sounding devices shall be painted red and clearly marked "Fire Alarm." Either gongs or horns may be used. Any gong used shall be of the single stroke type with a tone distinctive from the regular passing bell system.

SPRINKLER - FIRE AND SMOKE DETECTION SYSTEMS IN SCHOOLS

School boards and school planners are urged to install sprinkler systems or fire and smoke detection systems throughout the school plant, or, at least in all hazardous areas. The initial cost should be weighed against possible savings if full or partial systems are installed. Lower insurance rates and less property damage can be expected in buildings with these features. The major factor for consideration, however, is the reduction of risks to people when these systems are part of the facility.

Statistics prove that the loss of life is much less in buildings equipped with a sprinkler system and/or heat and smoke detector devices.

FIRE ALARM SYSTEMS, SPRINKLER SYSTEMS AND SMOKE DETECTION SYSTEMS IN BUILDINGS SHOULD BE CONNECTED TO MUNICIPAL FIRE DEPARTMENT FOR MAXIMUM EFFECTIVENESS.

FIRE WALLS

In the past four years three large school buildings in the state have been destroyed by fire. In all three instances it was found that the fires travelled quickly from one part of the building to other sections above the ceilings in the classrooms and corridors. Whenever permanent partitions or walls are designed and erected they should extend to the underneath part of the roof. Such construction will delay the spread of fire and will help contain conflagrations to particular sections of the building. Such delays would many times enable fire-fighting personnel to reach the building in time to save major portions of the structure. In addition, when walls extend to the roof, improved acoustical conditions result.

CORRECT USE OF FIRE SAFETY FEATURES

As some recent fire disasters have demonstrated with tragic results, the most expensive fire protection equipment will be useless if made inoperable through carelessness or neglect. Even if all parts of the building meet or exceed the fire safety standards, the equipment must be in working order at all times. All personnel, from the school board and superintendent of schools to the custodian, share a role in this responsibility.

The misuse of anti-panic devices is widespread and can result in fire hazards. It is not uncommon to find fire screens in corridors propped open, the fireproof door to the boiler room wide open to help heat the basement, and main exit doors fastened with a dead bolt while the building is occupied. Often the proper hardware has been installed, but is out of order. This induces a false sense of security and results in a more hazardous condition than the use of inadequate hardware.

FIRE DRILLS IN SCHOOLS

There has been some misunderstanding regarding the requirements of fire drills in schools. Printed below, for your information and guidance, is Section 17-3 from the Life Safety Code, pertaining to Educational Occupancies.

SECTION 17-3 EDUCATIONAL OCCUPANCIES

17-311. Drills

17-3111. Fire exit drills shall be conducted regularly in accordance with the applicable provisions of the following paragraphs.

17-3112. There shall be at least 8 fire exit drills a year in schools through Grade 12. In climates where the weather is severe during the winter months, weekly drills should be held at the beginning of the school term to complete the required number of drills before cold weather in order not to endanger the health of the pupils.

17-3113. Drills shall be executed at different hours of the day or evening; during the changing of classes, when the school is at assembly; during the recess or gymnasium periods, etc. so as to avoid distinction between drills and actual fires. If a drill is called when pupils are going up and down stairways, as when classes are changing, pupils shall be instructed to file in orderly manner and proceed immediately to the nearest exit. Fire chiefs are encouraged to sound the fire alarms unannounced when practical.

17-3114. Every fire exit drill shall be an exercise in school management for principal and teachers, with the chief purpose of every drill complete control of the class so that the teacher can form its ranks quickly and silently, halt it, turn it, or direct it as desired. Great stress shall be laid upon the brisk, quiet, and orderly execution of each drill. Running shall be prohibited. If there are pupils incapable of holding their places in a line moving at a reasonable speed, provisions shall be made to have them cared for by the more sturdy pupils, moving independently of the regular line of march.

17-3115. Monitors shall be appointed from among the more mature pupils to assist in the proper execution of all drills. They shall be instructed to hold open doors in the line of march or to close doors where necessary to prevent spread of fire or smoke, as per 5-2134. There shall be at least 2 substitutes for each appointment to provide for proper performance in case of absence of the regular monitors. The searching of toilets or other rooms shall be the duty of teachers or other staff members. If teachers are to do the searching, it should be done after they have joined their classes to the preceding line.

17-3116. As all drills simulate an actual fire condition, pupils shall not be allowed to obtain clothing after the alarm is sounded, even when in home rooms, because of the confusion which would result in forming the lines and the danger over dragging apparel.

17-3117. Each class or group shall proceed to a predetermined point outside the building and remain there while a check is made to ascertain that all are accounted for, leaving only when a recall signal is given to return to the building, or when dismissed. Such points shall be far enough away from the building and from each other to avoid danger from any fire in the building, any interference with fire department operations, or any confusion between different classes or groups. It is suggested that a preplanned area be designated where students can be taken to get them out of inclement weather, and away from possible injury when a fire occurs.

17-3118. Where necessary for drill lines to cross roadways, signs reading **"STOP! SCHOOL FIRE DRILL"** or equivalent, shall be carried by monitors to the traffic intersecting points in order to stop traffic during the period of the drill.

CHAPTER XIII - A HEALTHFUL SCHOOL ENVIRONMENT

In planning a healthful school environment, many factors must be considered. The "total environment" of the school must contribute to the physical well-being of students and provide surroundings conducive to good mental health. A school building should be comfortable, pleasant and safe.

The "red brick box" with fresh paint and clean windows of bygone years is no longer satisfactory. Aesthetic considerations, from landscaping and grounds to attractive learning areas in pleasing colors, are part of school planning. Appreciation of beauty is a part of the school environment - an aesthetically appealing school is not necessarily expensive. Designers and architects can apply their professional expertise to provide a functional, flexible structure that will not only fulfill the educational specifications, but will also offer the intangible aspects contributing to a healthful total learning environment.

HEATING AND VENTILATION

The correct temperature and ventilation are basic conditions for a comfortable environment and the type of system to be installed for satisfactory heating and ventilating conditions should be selected only after thorough evaluation by the committee with the advice of the Architect/Engineer. Heat in schools is supplied by oil (light and heavy), gas and electricity. Some factors to be considered in selection of the type of heat are:

1. Initial cost of installation.
2. Fuel availability.
3. Annual fuel cost. *
4. Maintenance.

The heating and ventilating systems are closely connected in function and operation and must be considered together in planning and installation. The function of a ventilating system is to exhaust the used air in a given space and replace it with a corresponding amount of fresh air.

MINIMUM REQUIREMENTS FOR PROPER VENTILATION

1. Ventilating will refer to that outside air required for healthy maintenance of metabolic functions.
2. The basic ventilation rates for areas other than those listed below will be 5 cubic feet per minute (CFM) per occupant when space is occupied.
3. The following spaces shall be provided with a ventilation rate greater than 5 cfm/occupant

gymnasium	-	15	cfm/participant
		5	cfm/spectator
cafeteria	-	15	cfm/occupant
		5-15	cfm/occupant, if used as instructional space
labs	-	5	cfm/occupant plus special exhaust
shops	-	5	cfm/occupant plus special exhaust
kitchen	-		as determined by exhaust requirements
locker rooms	-	15	cfm/occupant
toilets	-	50	cfm/fixture

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* In determining annual fuel cost, allowance must be made for mandatory ventilation rates as hereinafter defined.

These requirements were based on:

a. Study performed by the National Bureau of Standards.

b. Latest ASHRAE recommendation.

c. Research study by Richard Stein Associates, Architects.

As these are minimum requirements, no credit can be taken for introduction of air during period breaks when doors are opened or for infiltration of air when the building is unoccupied.

Committees and designers should review recommendations given in Chapter VII for suggestions regarding heating and ventilating efficiency.

Special Ventilation:

a. Hoods with mechanical exhaust shall be installed over steam kettles, dishwashers, ranges and other heavy-duty appliances.

b. Removable grease filters shall be provided in kitchen duct-work with adequate clearance from ends of flues or appliance vent to grease filter. Provisions for cleaning shall be provided.

c. Dampers shall be provided in ducts from main kitchen exhaust hoods.

d. Cafeteria ventilation can be combined with the same exhaust system providing kitchen ventilation; however, consideration must be given to the reduction of the transmission of noise between rooms.

e. Dry chemical or CO^2 heat actuated fire extinguishers shall be provided in range hood.

4. Local mechanical ventilation shall be provided at benches for electrical welding and also at spray paint stations.

5. Internal combustion engines shall be exhausted to the outdoors.

Duct Design and Construction

This shall follow standard practices. Grills from two or more rooms shall in no case open directly into a common flue or duct, individual ducts may be gathered into trunk lines. Exhaust ducts or flues shall be fire resistive throughout and shall have self-closing dampers when passing through fire partitions and ceilings. Exhausting through corridors shall not be permitted.

AIR CONDITIONING

Air-conditioning installations shall meet the requirements and recommendations of the American Society of Heating, Refrigeration and Air-Conditioning Engineers. When the educational specifications are being formulated, some thought might be given to year round use of school facilities. If this type of use is made of the plant, air conditioning might be installed in the building, or in at least certain parts of the structure.

WINDOWS IN CLASSROOMS

Several things must be considered in deciding on the amount of window space in a proposed building. Fewer windows tend to improve the heating. In the open school, the removal of interior walls leaves little area for chalkboards and tackboards; thus, more of the exterior wall must be used for this purpose. The increased use of audio-visual equipment in today's classroom has also tended to cut down the window area in the new schools.

While the trend has been to reduce the amount of window space in recent years, there are several reasons why sufficient window area should be provided in the classroom. Planners must take the aesthetic environment of the classroom into consideration and whether the lack of window space makes such learning areas unpleasant and less cheerful. If this is true, the learning environment will be neither mentally nor physically healthful. It should also be pointed out that windows were the original method of ventilating an enclosed space, and modern technology has yet to find a substitute for the invigorating influence of large quantities of fresh air entering, directly from the outside, a room in a building.

Consideration may also be given to the use of sliding door units equipped with screens. These can be placed at strategic places and used for egress under emergency situations.

As mentioned in Chapter VIII, window area should be no more than twenty percent of the exterior wall area.

VISUAL ENVIRONMENT - - NATURAL AND ARTIFICIAL LIGHTING

The visual environment must provide both comfort and efficiency. A proper visual environment promotes physical comfort, accuracy and speed in seeing, resulting in better learning. A poor visual environment, on the other hand, can have detrimental physical and psychological effects. Criteria for a proper visual environment include the level of illumination; control of light sources, glare, brightness; and contrast. Architects and planners might retain electrical or lighting consultants for advice on the types of lighting fixtures, candlepower, window areas in the various rooms, the location of the rooms in relation to the direction of sunlight, and the color of the walls. The color surfaces of equipment and furniture are also important factors in creating a visually harmonious environment.

CLASSROOM LIGHTING

The sense of sight, too often taken for granted, is of vital importance in the education of a child. Seeing is a very complex process and involves not only the eyes and brain, but indirectly all other parts of the body. Factors which affect the seeing process adversely may also have a harmful effect upon the child's general well-being. Good light is of primary importance to good vision and since most close eye work required of students is done in the classroom, it is extremely important to have the best visual equipment. Studies show that proper lighting in classrooms produces positive results; namely in:

1. Greater desire to work and to concentrate on the tasks assigned;
2. Less fatigue and its attendant effects (lack of interest, indolence, nervousness, poor achievement, bad posture);
3. Greater comfort and contentment;
4. More cheerful environment conducive to better mental health; and
5. Greater neatness and accuracy in work.

The level of lighting has been measured in terms of quantity usually, and the emphasis should be on visual comfort and efficiency and thus embrace the entire visual environment.

The following recommended minimum standards of illumination level have been set, keeping in mind (1) the welfare of the eye, (2) the learning environment and (3) reasonable economics of installation and operation.

The eyes can function under extremes of high and dim light, but the power to discriminate fine

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details is affected by the amount of light, and usually dim light causes fatigue even to normal eyes. However, the quantity of light must be evaluated by the quality of illumination and a balance of brightness. Excessive differences of brightness and glare that exist in the visual field makes it difficult for the eye to adjust readily and efficiently.

MINIMUM STANDARDS FOR AMBIENT LIGHT LEVELS FOR NEW CONSTRUCTION *

General instructional areas	30 - 50 fc
Instructional areas for partially sighted	50 - 70 fc
Study halls, lecture rooms, science laboratories, offices, etc.	30 - 50 fc
Sewing rooms, typing rooms, drafting rooms, shops	70 fc (over the tasks)
Auditoriums, cafeterias, all-purpose room	10 - 15 fc *
Gymnasiums	15 - 30 fc *
(if used for study halls)	30 - 50 fc
Locker rooms, washrooms, corridors with lockers	10 - 15 fc
Open corridors and storerooms	10 fc

Insofar as possible, the above standards must be glare free and proper contrast should be provided. It is suggested that higher levels of "good" lighting be provided over tasks that involve fine detailed work.

In recognition of the differing opinions of qualified authorities in the lighting field, the emergence of "equivalent sphere illumination" as a better measure of the quality of the visual environment than raw footcandles, the cost and administrative difficulty of measuring "equivalent sphere illumination" by presently available methods and equipment, and the present state of flux in research on the visual environment, the following additional provision is made:

> Local school authorities who wish to vary from the standards set forth in the manual may make application to the Commissioner of Education to do so, presenting evidence as to the equivalency between their proposed designs and the requirements listed. If there is reason to believe that the proposal represents a favorable departure from the guide standards or provides at least equivalent quality in the visual environment, permission to vary may be granted.

SONIC ENVIRONMENT

Noise levels in a school are as important to the learning process as a good visual environment. New educational methods and innovations in school construction require new techniques in sound control. In the traditional building, school activities take place in stable groups, within a fixed area or classroom. Generally in this type building noise control is concerned with student circulation between

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* These standards are in keeping with recommendations of the Federal Energy Administration and Richard Stein Associates, Architects. Committees and designers should review recommendations given in Chapter VII for suggestions regarding illumination efficiency.

These minimum requirements apply to the general environment or total surroundings (ambient level) of each area.

Additional light will be provided when used for exhibitions, games, programs, or other similar purposes.

classes, at recess time or in certain learning spaces such as shop, gym, or the music suite. In the activity centered school, the type of learning activities and methods necessitates newer approaches to noise control. There is generally a greater freedom of movement by students; the learning activities are organized in groups of varying sizes, taking place in larger spaces, such as in the "open-concept" schools. These newer trends require noise control of a different type using such techniques as room dividers, movable partitions, acoustical ceilings, carpeting on floors and different kinds of wall finishes and surfaces.

Zoning of buildings by various levels of noise is an effective means of control. Those activities, namely, shops, etc., can be situated together, and might be located in that part of the building which is close to an external noisy area.

Noises that result from the learning activities are not the only ones to be considered. When selecting a site, various types of external noises should be taken into account. When possible, the site should be free from such noises as highway and air traffic, as well as certain types of industry.

WATER AND SEWAGE REQUIREMENTS

An adequate water supply and sewage disposal system are essential elements of any school building and are subject to control by a state agency.

THE NEW HAMPSHIRE WATER SUPPLY AND POLLUTION CONTROL COMMISSION IS CHARGED WITH THE RESPONSIBILITY OF APPROVING THE WATER SUPPLY AND SEWAGE DISPOSAL SYSTEMS.

(See Chapter II and V regarding this requirement.)

If the site being considered cannot be connected to an existing municipal system and the district must supply its own water to the school, this agency must approve the source, condition and volume of water to be used in the school. The volume is determined by the program to be offered; the educational specifications should provide the guidelines for all decisions with regard to site or source of water supply. Water from such supplies must be tested for purity and condition periodically.

IN GENERAL, 15 GALLONS PER DAY PER PERSON WILL BE REQUIRED: THIS INCREASES TO 30 GALLONS PER DAY IF PHYSICAL EDUCATION AND A HOT LUNCH PROGRAM ARE OFFERED.

FIXTURES

Each building must be designed with a minimum number of plumbing fixtures to provide for the physical needs of the occupants of the facility. The following is listed for the guidance of architects, engineers and school boards:

DRINKING FOUNTAINS

There should be at least one drinking fountain per 60 students. It is recommended that a separate fountain be located in each elementary classroom and in other specialized instructional areas. Electrically-cooled fountains offer many advantages; for sanitary reasons the bubbler shall be so constructed as to prevent the user from placing his mouth on the opening. One drinking fountain in the building must be of the type that makes water accessible to one in a wheelchair.

THE DRINKING FOUNTAIN OR BUBBLER
SHALL BE SEPARATE FROM THE HAND WASHING SINK

TOILET ROOMS

Toilet rooms should be of adequate size, accessible to all classrooms, and well lighted and

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ventilated. Separate facilities should be provided in the administrative suite, the gymnasium area, and the custodial unit, and are highly recommended in kindergarten and other primary classrooms. Tiled walls and floors are preferred for easy cleaning and maintenance. If the school is to be constructed on the open plan, common toilet facilities will reduce installation costs because all plumbing facilities can be in one location.

SINKS

ONE SINK, SUPPLIED WITH COLD WATER, MUST BE PROVIDED IN EACH BUILDING. The location and number of sinks will depend on the size of the building and the educational program. The following guidelines should be considered:

1. One sink supplied with both hot and cold water is strongly recommended in each elementary classroom and in some secondary classrooms, janitor's room, and library workshop.
2. Shop sinks should be suitable for group wash-ups.
3. One sink supplied with both hot and cold water is recommended in each study unit of the art room, homemaking room, science laboratory, shops, kitchen, and social studies laboratory.
4. At least one slop sink for each story is recommended; additional slop sinks should be installed where necessary to reduce custodial travel.
5. One slop sink in each custodial service room.

MINIMUM REQUIREMENTS FOR PLUMBING IN SCHOOL BUILDINGS

Toilet Fixtures

Water Closets:		Urinals:	
Girls, Grades K - 8	1-30	Boys, Grades K - 8	1-30
Boys, Grades K - 8	1-45	Boys, Grades 7 - 12	1-45
Girls, Grades 7 - 12	1-45		
Boys, Grades 7 - 12	1-60		

Lavatories

Boys and girls, all grade levels 1-40

Note: Wash fountains and lavatories in special areas such as shops, locker rooms, lavatories, etc., will be in addition to the above requirements.

Suggested sizes and heights of plumbing fixtures by age of pupils.

Water Closets	Communal	Classroom
All grades, K - 12	Standard size	Standard size

Urinals

K - 2 - 24''

3 - 12 - 30''

Lavatories, Height to Rim

Kindergarten - Grade 2	26''
Grades 3 - 8	30''
Grades 9 - 12	32''

Drinking Fountains, Height to Nozzle

Kindergarten - Grade 2	28''
Grades 3 - 12	40''

All fixtures shall be of an approved type, and plumbing must conform to local and state rules and regulations.

CHAPTER XIV - FINANCING THE SCHOOL BUILDING PROGRAM

There are several methods of financing school construction, and school boards should, after careful consideration and with the advice of legal counsel, choose the plan which is most appropriate for the proposed building and for the financial resources of the district. Each method has certain advantages and disadvantages, which are discussed briefly below:

THE "PAY-AS-YOU-GO" PLAN

Under this plan a capital project is financed by the use of current revenues which are voted annually as the project progresses. A large school system with constant building needs predictable on an annual basis may choose this type of funding. One evident advantage of this method is a reduction of the total project cost, since no interest would have to be paid for a bond issue. On the other hand, most districts, especially small ones, may find this method imposes too great a burden on the local tax structure, since the adoption of the "pay-as-you-go" plan locks a district into an automatic increase in the local property tax rate (quite apart from other school needs) for as many years as it takes to complete the project. Although most districts may not finance major projects in this manner, some capital outlay programs, such as site acquisition, a small building addition or renovation, or the purchase of equipment, may be carried out through annual budget appropriations.

CAPITAL RESERVE FUNDS

According to RSA 35:1, passed by the 1943 General Court, school districts are authorized to establish reserve funds for the construction, reconstruction, or acquisition of a specific capital improvement or specific items of equipment. By this method certain funds are set aside on a regular basis for future capital improvements and are accumulated until the fund is sufficient to finance them.

The advantages of this plan, as under the "pay-as-you-go" plan, are that no interest need be paid. Also the funds are usually invested thus earning dividends which tend to offset rising construction costs. On the other hand, taxpayers may be unwilling to vote for large sums of money to be placed in a capital reserve fund year after year to finance indefinite building plans, and the purpose of the fund may be changed by the voters before enough money is accumulated to initiate the originally projected program. Here again the importance of long-range planning becomes evident; taxpayers will be much more likely to support a capital reserve fund if the needs and goals of the district over a period of years have been determined beforehand and are presented in an orderly format.

It is recommended that committees and school boards give careful study to RSA Chapter 35 if they are considering a capital reserve fund. This chapter outlines the legal requirements for such funds, including the purpose, how voted, payments, investments, Trustees of the Funds, payments from surplus, appropriation, expenditures, and change of purpose. Legal counsel should be retained for advice at all stages of the proceedings.

SERIAL BONDS OR NOTES

The most frequently used method of financing a school building project is the issuance of bonds or notes. Borrowing all the money needed for a project at one time offers the advantage of spreading the cost of financing over several years while allowing the projected facilities to be constructed to serve immediate needs. This type of financial approach tends to minimize rising costs that might be experienced under a "capital reserve" plan. With proper planning, this type of financing may be obtained at a time when interest rates are favorable. The cost-sharing aspect of financing by bond issue should also be considered with a 20-year bond issue, for example, the costs of the new building are borne proportionately by both present and future taxpayers, i.e., those who are to use the building after its completion are helping to defray the costs of construction. Other advantages of this method are the stabilization of the local tax rate by consistent payments over a period of years; the reduction of the district's indebtedness, permitting borrowing for other projects if necessary; protection of the district's credit; and simplification of budget procedure through planned annual payments. This method has certain disadvantages, chief of which is the increased total cost of the project due to the necessity for paying interest; also taxpayers may object to paying for facilities for many years after they have been in use and perhaps in need of repairs or additions before the original structure is paid for. This objection may be countered by sound planning procedures.

Bonds or notes may be issued by a municipality, including school districts and counties, for the acquisition of land, for the construction, reconstruction, alteration, and enlargement or purchase of public buildings, for other public works or improvements of a permanent nature, for the purchase of equipment of a lasting nature, and for the payment of judgments. Bonds or notes may not be issued for the payment of expenses for current maintenance or operation. Municipalities, district, or counties shall not issue bonds payable on demand.

PRELIMINARIES TO THE ISSUANCE OF NOTES AND BONDS

Competent legal counsel should be retained early in the financing program. Bond counsel, who generally represents a financial institution, can help guide a bond or note issue through the necessary legal requirements. School boards, administrators, and committees should be thoroughly familiar with the provisions of the Municipal Finance Act, RSA Chapter 33, governing the issuance of bonds and notes. Sections 8-a and 8-b, of the statute established requirements for hearings, voting procedures and a method for reconsideration of votes. As the General Court may amend the statute at any time, it does not seem advisable to include the detailed procedures in this manual. However, it is wise for school boards and/or local administrators to maintain communications with the Department of Education regarding the legal requirements for passing bond or note issues. Guidelines written by bond counsel are available for local guidance and these are up-dated periodically.

STATE GUARANTEE ON BOND ISSUES

RSA 195-C established a School Building Authority whose duty is to consider and investigate applications for a state guarantee for a portion of a bond issue voted for school construction from the following types of school districts.

A. Receiving districts under **AREA** school plans (RSA 195-A).

B. Cooperative school districts (RSA 195).

C. Districts which have or plan to put in operation an approved dual enrollment plan under RSA 193 1a

D. A school district whose enrollment has increased ten percent or more in any one school year.

The maximum state guarantee for the receiving district in an **AREA** school plan is determined by the proportion of students from sending districts to the total enrollment in the **AREA** school as determined by the State Board of Education. The other three types of districts may have a state guarantee up to seventy-five percent of the total bond issue voted. Application for a state guarantee will be made to the School Building Authority in care of the Department of Education

DEBT LIMIT OF SCHOOL DISTRICTS AND CITIES

The following information on the debt limits for various types of school districts and on the computation of these limits will form the foundation for any funding program involving the issuance of bonds or notes.

1. Debt limit RSA 33 4-a and 33 4-b

    a. School districts shall not incur indebtedness at any one time of an amount exceeding seven (7) percent of its assessed valuation as last equalized by the Tax Commission in RSA 33:4-b.

b. Cities shall not incur indebtedness for school purposes of an amount at one time outstanding exceeding seven (7) percent of its assessed valuation as last equalized by the Tax Commission, as determined in RSA 33:4-a.

2. Debt limit computation shall be based on last locally assessed valuation of the municipality as equalized by the Department of Revenue Administration, formerly the Tax Commission. Added to the assessed valuation as equalized is an amount derived from credits under RSA 71 and 72, passed in the 1970 special session of the General Court. The base valuation for debt purposes is published every two years by the Department of Revenue Administration. Whenever several municipalities possessing the power to incur indebtedness cover or extend over identical territory, each such municipality shall so exercise the power to incur indebtedness under the foregoing limitations so that the aggregate indebtedness of such municipalities shall not exceed nine and seventy-five hundredths (9.75) percent of the valuation of the taxable property as hereinbefore determined, except for cooperative school districts.

3. Cooperative School Districts RSA 195:6 - Each cooperative school district shall have the power to borrow money and issue notes or bonds in conformity with RSA 33 provided, however, indebtedness of a cooperative district organized to provide both elementary and secondary schools may be incurred to an amount not to exceed ten (10) percent of its assessed valuation as last equalized by the State Tax Commission.

   Whenever only a part of the educational facilities of a local school district are incorporated into a cooperative school district, the remaining portion of the district shall continue in existence and function as previously. The limits for cooperative districts under these conditions are established as follows:

   a. Elementary grades only: five (5) percent of valuation as last equalized.

   b. Grades nine to twelve: five (5) percent of valuation as last equalized.

   c. Grades seven to twelve: six (6) percent of valuation as last equalized.

   Added to these limits are the credits as voted in RSA 71 and 72 mentioned earlier under paragraph 2.

4. **AREA** schools: In the construction of **AREA** schools, the receiving district may borrow money for such purposes as provided in RSA 33 as amended. However, in calculating whether it is within its debt limit, there shall be charged thereto an amount no greater than its proportionate share of such capital outlay, which shall be the proportion which its then established enrollment in **AREA** school to be constructed or enlarged, bears to the then extablished total enrollment therein, as determined by order of the State Board. Attention is directed to RSA 195-A:7 for reference.

5. Exceeding debt limit: There is no provision in the statutes to permit a district to exceed its debt limit. A district may obtain this permission only through a special act of the General Court.

SCHOOL DISTRICT WARRANT

The articles to be included in the warrant authorizing the construction of school facilities must be carefully worded to assure the voters are aware of the matters to be acted upon. The articles should include the following points:

1. Authorization to build and equip the school, including acquisition of site.

2. Appropriation of the necessary funds and authorization for the issuance of bonds upon the

credit of the district.

3. Selection of a building committee to advise the school board in making the necessary contracts, and in the construction of the building.

4. Transfer of any Capital Reserve Funds into the building account for the construction of the school.

5. Possible authorization to invest bond monies and expend interest earned as a part of that project.

6. Authorization of school board and/or building committee to take necessary action for completion of project.

The placement of articles dealing with bond issues on the warrant is very important. Bond articles should first be in the warrant after election of officers, and in cases of town meetings, after zoning articles. If there is more than one article covering bonding, they should follow one another. The meeting may decide at what point the articles shall be acted upon. It is again suggested that the latest guidelines regarding bond issues and voting procedures be secured before preparing the district warrant.

CALLING THE SCHOOL DISTRICT MEETING

A district is authorized to issue bonds and notes only through the vote of the school district meeting, whether annual or special. It is important to observe all legal requirements when calling a school district meeting at which a bond issue is contemplated. The advice of legal counsel is vital to assure proper observance of all technicalities.

The legal requirements for annual and special school district meetings are summarized as follows:

1. Annual School Meeting

    a. Authorized by RSA 197:1.

    b. Warrant must be posted fourteen days prior to meeting, not including day of posting and day of meeting (RSA 197:7).

    c. Budget shall be posted at same time as warrant (RSA 197:5-a). If district is under municipal budget act, budget is prepared by budget committee, given to school board for posting with warrant (RSA 32:5).

    d. A two-thirds vote of those present and voting is required to authorize the issue of serial notes or bonds (RSA 33:8).

2. Special School Meeting

    a. Authorized by RSA 197:2, 3.

    b. Conditions for posting warrant and budgets same as for annual meeting.

    c. A two-thirds vote of those present and voting is required for authorization of bonds or serial notes.

    d. No appropriation or authorization of bonds or serial notes shall be made except by ballot nor unless the ballots cast at such meeting be equal in number to at least one-half of all the voters in the district entitled to vote at a regular meeting (RSA 197:3). (Exception - see 3 below).

    e. A copy of the warrant shall within one week after posting the warrant be published at least once in a newspaper of general circulation in the district (RSA 197:8).

    f. If a checklist was used at the last regular meeting, this list shall be used to ascertain the number of legal voters in the district and such list, corrected according to law, shall be used at the special meeting upon the request of ten legal voters of the district (RSA 197:3).

3. Special School Meeting with same authority as an Annual Meeting.

    a. Authorized by RSA 197:3 in case an emergency arises requiring the immediate expenditure of money.

    b. School board may appeal to Superior Court for a special meeting.

Authorization if granted gives the special meeting the same authority as an annual meeting for the appropriation of money and the issuance of serial notes or bonds. Such a meeting does not require that one-half of the voters be present. Other requirements of this meeting are the same as for a special school meeting in section (2) preceding.

It is extremely important that a careful record of the school district meeting be kept by the clerk of the school district when a bond or note issue is voted. The permanent record must include copies of the original warrant, the certificate of publishing notices in the newspapers for special meetings, and the actual vote count. With regard to this last item, the total number of votes cast must be recorded, as well as the number voting for and against, since according to law a bond issue carries only by two-thirds of those voters present and casting ballots.

MUNICIPAL BUDGET COMMITTEES AND BOND ISSUES

School boards and officials of districts that are under the Municipal Budget law and expect to vote on a bond issue should be very familiar with Chapter 32 of the statutes. As mentioned elsewhere, it is advisable to secure legal counsel when embarking on a school project resulting in a bond issue.

Particular attention is directed to sections 5, 6, 8 and 9 of Chapter 32. The budget committee must hold a separate hearing on the bond issue in addition to the public hearing required in RSA 33:8a. This hearing must be held at least fifteen days prior to the meeting at which the bond issue is voted. The bond issue must be included as part of the posted budget committee's budget. This is true for a special meeting (RSA 32:6) as well as an annual meeting since the same procedures must be followed by the budget committee for both types of meetings.

If the bond issue will increase the recommended budget of the budget committee by more than ten percent (and in most cases it will) the budget committee must act favorably on the bond issue and recommend its passage to meet the requirements of RSA 32:8. This is one of the many legal requirements that is checked carefully by bond counsel when authenticating bond issues. Attention is directed to RSA 32:9, in which it states that no appropriation shall be made at special meetings unless approved by the budget committee. Again, refer to section 6 of the chapter regarding procedures of the budget committee.

ISSUANCE AND SALE OF NOTES OR BONDS

After the school district meeting has authorized the issuance of bonds or serial notes, the school board should meet as soon as possible to decide on the following points:

1. Whether the notes or bonds should be issued immediately or at a later date. (see the follow-sections).

2. The length of the borrowing term.

3. Whether to negotiate the bonds with a New Hampshire securities institution or bank, or whether to advertise the issue for public sale.

Thorough consideration should be given to all aspects of the bond issue, since wise decisions will result in substantial savings.

TIMING OF ISSUE

The bond market is highly competitive. Interest rate level is governed not only by factors of supply and demand prevailing at the time of sale, but also by competition among governmental issue and by monetary conditions in the private sector of the economy. Information relative to interest rates is received each week in the Department of Education and this data is available upon request.

Under RSA 33:7a, district may borrow temporary funds in anticipation of money to be received from the sale of bonds. Districts are allowed one year to determine the most advantageous time to enter the bond market; however, the bonds or notes must be sold at the end of this period regardless of the then prevailing interest rates. Help in assessing the state of the bond market may be obtained from such publications as The Bond Buyer or the Wall Street Journal, and from bond dealers and investment bankers.

NEGOTIATING THE ISSUE OF BONDS

The school board is the body authorized to negotiate the sale of bonds for the school district. Three common methods of selling bonds are:

1. Direct sale at a specified interest rate and price to a local bonding house.

2. Direct sale at a specified interest rate and price to a local bank.

3. Issuance of a call for public bids on the issue.

Each procedure has advantages and disadvantages. Local banks can provide direct assistance with the necessary legal procedures and may offer the advantage of greater familiarity with local conditions. In recent years, however, public bid seems to have become the preferred method for negotiating bond issues. In these cases the school board and its legal counsel work with a municipal department of larger metropolitan banks, who can usually provide more services than smaller investment institutions. In addition, such banks generally employ bond counsel, whose advice may be very helpful in meeting legal requirements early in the process.

Legal assistance is an absolute necessity in planning and administering the bond program. School board should expect their local attorney to help in meeting all state and local requirements, while bond attorney will not only advise the local counsel, but must also approve the legality of an issue to assure its favorable reception by major bond buyers.

SERVICES RENDERED BY BANKS' MUNICIPAL DEPARTMENTS IN CONNECTION WITH MUNICIPAL BOND ISSUES

1. Review of, or preparation of, warrant article(s) and motion(s) by recognized bond counsel prior to voting by school district.

2. Processing of certificates from school district clerk and other school district officials and forwarding them to bond counsel, relative to legality of bonds authorized by school district.

3. Liaison with New Hampshire School Building Authority when applicable.

4. Obtain review of municipality's credit rating with recognized rating services, particularly Moody's Investors Service. If no rating, obtains establishment of a provisional rating.

5. Review with school district the timing and details of bond sale. The normal policy is to recommend sale of bonds soon after construction contract for project is awarded. Other factors such as need for bond anticipation funds, market conditions or desire for a particular principal payment date occasionally dictates otherwise.

6. Preparation of notice of sale, advertising bonds for sale, describing nature of project and its financing, financial condition of community, and other major features of the bond issue. Distribution of notices to nationwide list of Municipal Bond Dealers, banks, and other potential bond purchasers.

7. Advertisement in The Bond Buyer for bond issues in excess of $1,000,000. The Bond Buyer is the financial newspaper of the municipal bond business.

8. Opening sealed, competitive bids at bank and advice to school district in determining best bid. Preparation of bonds by recognized bank note company and assistance to school district in proper signing and sealing of bonds.

9. Delivery of bonds to purchaser and advice for proper investment of temporary unused funds as authorized by law.

10. Furnishing of chart showing principal and interest payments over the life of bonds due at banks.

11. Meeting with school district and other municipal officials as is necessary and desirable.

CHAPTER XV - PRESENTING THE BUILDING PROGRAM TO THE PUBLIC

The approval of a school building program is largely dependent on public knowledge and support. Recent statistics indicate a large increase in the number of communities that have turned down bond issues or other types of funding for school construction. One major factor in the failure of school building programs is often the neglect of public relations. Good public relations between school and community cannot be created overnight; this aspect must be considered in the earliest stages of planning (See Chapter I, "Planning Educational Facilities"), and a channel of communication must be provided which will permit a two-way flow of communication between planners and community. A school board or building committee may assume this task, using all services available, such as an educational consultant, the architect, groups and clubs, public hearings, and news media, to present the program and at the same time make themselves available throughout the planning and building process to all expressions of public concern.

If possible, it would be more desirable to allocate this function to a special subcommittee, which would act as liaison between the building committee and the community. The size of the committee is important. It is desirable to have diversity of community viewpoints represented, but too large a committee is not effective. Nine to fifteen members is sufficient in most cases. A member of the building committee should be designated as chairman of this subcommittee, and the school board should, after careful consideration, select the remaining members from representative segments of the community.

Two basic considerations must be taken into account in developing any kind of group effort. First, all group effort takes place in some kind of social system composed of people with some interest in common; the school board, building committee, and school administrators are the nucleus of this system; every member of the community has an interest or a stake in the educational system. Second, for every group action there exists within the social system past experience, either good or bad, with a history of success, failure, crisis, or conflict. The factors leading to success or failure should be carefully analyzed; good experiences should be capitalized upon, and poor experiences should be studied for techniques and actions to be avoided.

TECHNIQUES FOR PUBLIC RELATIONS

Past experience has shown that certain techniques are successful in helping the general public recognize the need for a program. The following general principles and specific suggestions may be helpful in building a good relations program:

1. Basic Education. This is a long-range program, but is effective in getting facts across to the public.

2. Program Development Committees. Certain key people in the community study situations, problems, resources, etc. Publicizing their findings contributes to public awareness.

3. Exploiting a Crisis. When a crisis arises, it may be used to point up certain needs. Examples are unexpected overcrowding in certain grades due to sudden in-migration, explosion of a boiler, breakdown of a heating or electrical system due to antiquated installations, etc.

4. Demonstration or Trial. A need for comparison may be created by demonstrating how improvements may be made.

5. Building on Past Experiences. For instance, the recent successful introduction of new curriculum offerings (languages, sciences, etc.) or other programs (expansion of physical education or vocational courses) may be used to show that a new program is necessary and beneficial

6. Channeling Complaints. If the public is against some aspect of the school system, it may be possible to channel this negative attitude into support for positive action

7. Survey or Questionnaire. The process of planning, conducting, and analyzing a survey on school needs gives participants a clearer insight into the problems involved and may bring useful suggestions to the planning committee's attention.

There are many specific means of communicating with the public, and school planners should select the methods that prove most effective in their community. For all the opportunities provided by modern technology, the person-to-person approach remains by far the best public relations procedure. Civic organizations, the P.T.A., clubs, and other associations offer opportunity for this two-way exchange of information. Telephone campaigns and surveys (mentioned above) are also helpful in ascertaining community attitudes and opinions.

Public informational meetings can be held by the school board and staff. Such meetings would be especially timely after the educational specifications have been formulated in order to bring the public up to date and give citizens an opportunity to react and to make suggestions.

Newspaper articles are an excellent means of presenting a program. Editors and reporters should be asked for suggestions. Since effective utilization of newspapers means continuous use, series of articles should be planned, presenting the facts as simply as possible in a well-organized format. If acceptable to the paper, pictures should be used wherever feasible.

Radio and television offer the same advantages of reaching large sections of the public at one time. Use should be made of these media if not too costly.

A newsletter, notice, leaflet, flyer or inserts with school mailings can be used throughout the program to disseminate information and to announce hearings or meetings.

One of the final and perhaps most important sources of information for the public is the brochure or report of the project that will be presented for approval. The contents of the brochure should be well planned: sufficient information must be included to provide full coverage of all aspects of the program, but care must be taken to keep the presentation brief and concise. The following features might be incorporated in this publication:

1. An attractive cover, possibly with a colored drawing of the new school or addition. A black and white photograph may be used if color is too expensive.

2. A section explaining the need for new construction. This might include enrollment projections, an analysis of present buildings, program needs, community needs and use. Tables, graphs, and charts are effective.

3. An explanation of how the proposed construction will meet these needs.

4. A floor plan or drawing of construction, with each room labeled and easily identifiable.

5. A section on the financial aspects of the program. This would include an estimated budget for the project, the borrowing capacity of the district, tax evaluations of the district, means of obtaining funds, the cost of borrowing money, the estimated annual effect of the tax rate, and any other pertinent details.

6. A section on the advantages of the project for the children and the community in general. Statements from citizens might be included here.

7. A complete list of committee members by areas of activity. This will inform the public that the project has been developed with thorough, careful planning.

The brochure can be printed as a separate pamphlet or published in a local newspaper with wide circulation. Discretion is advisable in choosing the format since many communities might tend to interpret an extravagant, elaborate publication as an indication that the building will involve unnecessary expense. If a public relations committee has been working closely with the planners at every stage, the information gathered from the public and familiarity with the community will be helpful in making this decision.

CHAPTER XVI - PROCEDURES - APPLYING FOR BUILDING AID*

The purpose of this chapter is to outline the procedure that applicants must follow to have building projects approved for building aid. The procedure follows the provisions of the law for building aid. RSA Chapter 198:15 and the policies of the State Board of Education. Persons concerned with building projects should be thoroughly familiar with the contents of the statute.

STATE BOARD OF EDUCATION POLICIES

ENERGY - - "It is to be expected, before approval of any submitted building plans for any purpose that involves school construction, that the very latest technology available will be utilized in energy conservation."

ELEMENTARY SCHOOLS - - Any school district planning the construction of an elementary school, or an addition thereto, with a current enrollment adequate to permit assigning one grade to a teacher, will be eligible for full reimbursement of school building aid under the provisions of RSA 198:15a-h, if all other requirements are fulfilled, including the approval of site, plans and specifications.

Any school district planning the construction of an elementary school or addition of less than four classrooms, or with a current enrollment that will not permit assigning one grade to a teacher, must first present its project to the State Board for approval before being considered for aid under RSA 198:15a-h.

HIGH SCHOOL - - Any school district planning the construction of a high school, or an addition thereto, with a proposed program of studies and curriculum that under the minimum standards for high schools would result in an approved status for such school after evaluation by the State Department of Education, will be eligible for full reimbursement of schoolbuilding aid under the provisions of RSA 198:15a-h if all other requirements are fulfilled, including the approval of site, plans and specifications.

PLANS, SPECIFICATIONS AND COST ESTIMATES - - Plans, specifications, and cost estimates for school building construction must be developed by a registered architect in order to be approved by the State Board for building aid.

COST OF LAND - - Land purchased by a school district is not in itself eligible for a state grant under the school building aid law. However, if a school district purchases a parcel of land and subsequently builds a school facility thereon, in computing the amount of state building aid to be granted for such a project, the cost of land purchased shall be added to the cost of building construction and equipment, and the land purchased becomes eligible for building aid.

FALLOUT PROTECTION - - Expenditures for fallout shelters are not approved for building aid as this building feature is not within the authority granted the board under RSA 198:15a-h.

STEPS IN PROCEDURE FOR BUILDING AID APPROVAL

1. Local district should notify the State Department of Education at the inception of the building program.
    a. State Department of Education consultants will be available to aid local districts in the planning and designing of the facilities. The consultants can aid in the writing of educational specifications, if such help is desired.
2. Approval of site by the Department of Education.
    a. This will be done only after the following has been completed:

    (1) Approval of site by the New Hampshire Water Supply and Pollution Control Commission, if site is not accessible to a municipal sewage system.

  b. Written approval of site by the Department of Education (Form A24SA Site Approval).

3. Preliminary application for A24P will be submitted to the Division of Administration, Department of Education.

  a. Four copies of the educational specifications and four copies of preliminary drawings will be submitted with application A24P.

  b. Preliminary approval will be based on how well the building design meets the requirements as established in the educational specifications, plus statutory requirements, and other regulations.

    (1) Generally, it will be necessary to meet with consultants in the Department of Education and other state agencies for this purpose.

4. Final drawings and building specifications shall be submitted to the Department of Education and to the Division of Safety (State Fire Marshal) for final review.

5. Form A24FM (Fire Marshal's approval) will be issued and distributed upon his approval of drawings and specifications.

6. Form A24FA (Final Approval) will be issued and distributed by the Department of Education after drawings and building specifications have been approved by the State Board of Education.

7. In accordance with RSA 198:15-c, project should not be put out for bid prior to final approval of the State Board of Education.

8. Building aid payments are made annually upon submission of Form A23 in June of each year and are based on the principal payments for bonded indebtedness in the school year when the aid is given. The final forms listed below will be completed and submitted to the Department of Education for each project before any building aid is given on a project:

  a. A24F final detailed application.

  b. A24S Supplemental Appropriation or Capital Reserve Expenditures.

  c. A25 Bond or note register.

  d. A26 Final project specifications and costs.

GENERAL

The following materials are available upon request at the Department of Education. These can be helpful to those planning a school facility.

1. Bibliography - Complete for most areas covered in guide.
2. Guide for selection of an architect.
3. Construction costs.
4. Site inspection worksheet.
5. Site rating form.